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Standard Clamps and Bolts for Machining

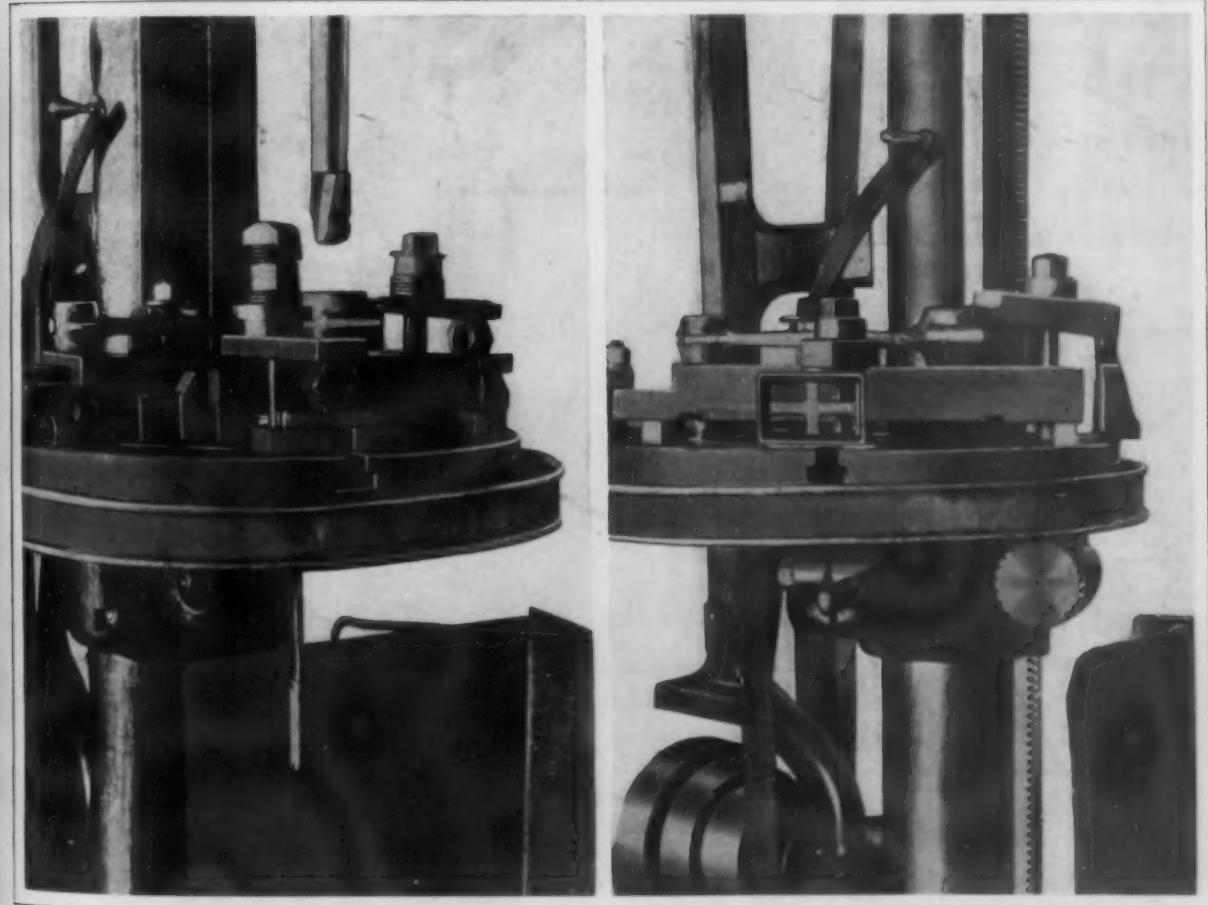
The Economies Effected in a Machine Shop by Providing a Carefully Worked Out Equipment for Setting Up Work

BY HARRY C. SPILLMAN AND H. CADWALLADER, JR.—

The introduction of cost systems and time studies in manufacturing plants has been the source of discovering and developing a number of short cuts which not only makes the task easier for the workman but increases production and shows a saving over the older

in a manufacturing plant having 300 men who work on machine tools.

The original idea of standard clamps was first conceived about ten years ago when a special clamp was used by an eastern plant to hold a Brown & Sharpe ma-



Before and After Using Standard Clamps, Showing the Miscellaneous Material Formerly Seized on for the Purpose

methods. A few years ago manufacturers did not realize the saving which could be made by making a study of the minor details—small items which are generally overlooked and passed by as not of sufficient interest to consider.

A standard system of clamps for holding work and jigs on the bed plate of machine tools has been developed which has cut the cost of setting up work from \$1320 per month to \$570, a direct saving of \$750 each month,

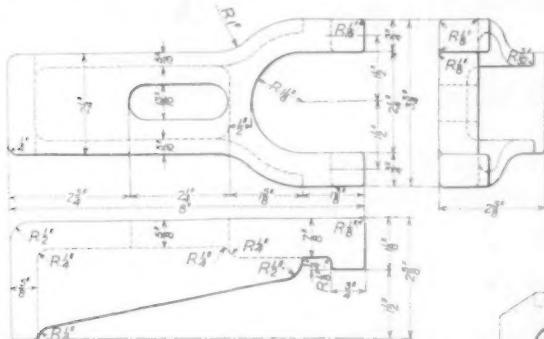
chine vise on the table of a machine. These clamps were always found jealously guarded in some machinist's tool box, and their advantages were appreciated as the clamps would appear whenever the opportunity presented itself. This was sufficient proof that they directly benefited and interested the workmen.

The average workman desires to make a showing for the day's work and nothing will discourage him to a greater extent than to have to waste time in setting

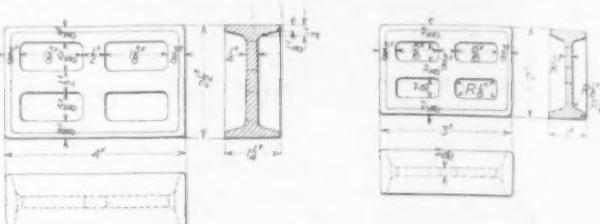
up his machine and then be forced to work harder in his endeavor to make up this loss of time. More opinions of the firm's methods are expressed by the workman while setting up than any other time. While he knows that the trips that he makes to the blacksmith shop to have tools made up may be approved by the foreman, he also knows that when the superintendent speaks to the foreman of the slow progress made on the job, that he, the workman, bears the blunt of the complaint.

The amount of time lost by machinists in trying to find suitable clamps, bolts and packing for setting up work is enormous. There is always something lacking which delays him; even if he could have a complete set of clamps made up for the job, they are mislaid, loaned

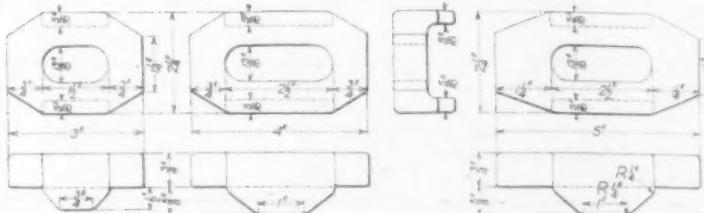
bolts in the plant mentioned was less than \$100. They have been in use over a year and there is still a fair amount of stock left in the storeroom to draw from. Thirty-nine separate pieces take care of all the work in the shop and this includes all clamps, washers, bolts and nuts necessary to set up any kind of work. The clamps are divided into two groups: a, single end clamp; b, double end clamps. The single end clamps are chilled cast iron, with packing cast iron on end to make a height of $\frac{7}{8}$ in. These clamps are made in four lengths, 3, $3\frac{1}{2}$, 4 $\frac{1}{2}$ and 5 $\frac{1}{2}$ inches overall. The 3-in. size is used on machines where the table is small. The clamps in general use is the 3 $\frac{1}{2}$ -in. size, and the two larger sizes are made to take care of exceptional cases where a longer reach is



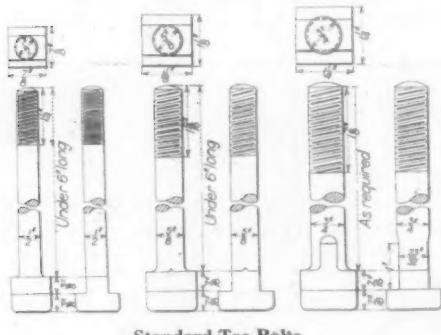
Malleable Iron Special End Bearing Clamp



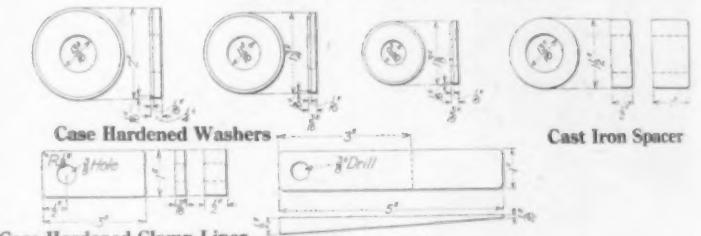
Cast Iron Packing Pieces



Malleable Iron Double End Clamps



Standard Tee Bolts

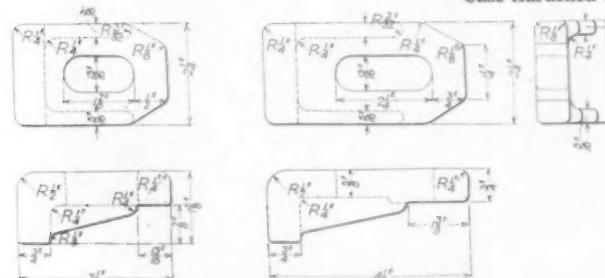


Case Hardened Washers

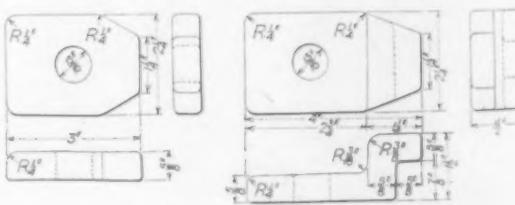
Cast Iron Spacers

Case Hardened Clamp Liner

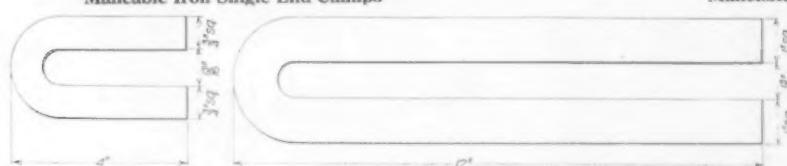
Case Hardened Wedges



Malleable Iron Single End Clamps



Malleable Iron Butts



Case Hardened U-Clamps

Details of the Various Standardized Articles for Machine Shop Use

or probably in use on another machine. These conditions are not only expensive to the firm but also cause the workman to be selfish and to hide or refuse to loan bolts and clamps which have been made up to suit the jobs he works on regularly. This means more trips to the blacksmith shop in order to have additional clamps made up, which will only suit that particular job or machine. Shops in this condition will find that they have about double the amount of money invested in clamps and bolts than it would take to make up a standard equipment. There is also the lack of interchangeability of these miscellaneous clamps and bolts.

The total expenditure of these standard clamps and

necessary. The oval slot in the clamps permits removing work without disturbing the set-up by simply pulling clamp back from work instead of moving the bolts.

The double-end clamp, which is also chilled cast iron, is made in five sizes, 3, 4, 5, 6 and 7 in. overall. These clamps are used on work which is set up quite a distance from the table and are used in connection with packing pieces. These packing pieces are designed so that each size will give a number of different heights; the 3-in. size gives the height of 1, 2, 3 and $\frac{5}{8}$ in. and the 4-in. size gives $1\frac{1}{2}$, $2\frac{1}{2}$, 4 and $3\frac{1}{4}$ in.

The standard table clamp is made of $\frac{5}{8}$ x 2-in. cold-rolled steel 12 in. long. This clamp has three slots $13/16$

in. wide and $2\frac{1}{2}$ in. long milled out. This clamp is used mostly as a guide for a jig on a table where it is necessary to move the jig in order to remove the work. As these clamps are all of a standard size they are also used for parallel strips.

The 3BL clamp is a plain low butt which serves as a stop to prevent the work from moving where heavy cuts are made after being clamped down. The 4BH is a high butt to reach over a web or to reach up high on work. This butt is also convenient to use as a clamp because of its shape. The other clamps in use are Williams drop forge finger clamps and U finger clamps. Standard wedges $3/16$ in. thick, 1 in. wide and 3 in. long, also $1/2$ in. thick, 1 in. wide and 3 in. long are used.

After taking measurements of all the table slots in machine tools, a standard size head was decided upon for all bolts: a $7/8$ -in. square head for $1/2$ -in. bolts, $1\frac{1}{8}$ -in. square for $5/8$ -in. bolts, $1\frac{1}{4}$ -in. square for $3/4$ -in. bolts and $1\frac{3}{8}$ -in. square for $7/8$ -in. bolts. The head proper of the bolts is not used to keep the bolts from turning in the table, but is milled to allow a portion of the head to enter the slot. This prevents the bolt from turning while the head proper serves only as a shoulder to hold the bolt in the table. All the bolts which are over 6 in. long have $1\frac{1}{2}$ -in. threads regardless of the size of the head. The standard washers are $3/16$ in. and $1/4$ in. thick, and the packing pieces are $1/2$ and 1 in. thick and the same diameter as the washers. These packing pieces are used for packing under clamps and to make up for extra length of bolts.

Experiments were made with clamps made out of malleable iron, cast steel and cast iron. The best material proved to be cast iron, as it retained its shape until broken. Chilled iron proved still better, as it kept the clamps free from marks of milling cutters and drills. They are also japanned, which adds to their appearance and acts as an incentive for the workman to take pride in them.

The standard clamps, previously described, are carbonized and afterwards polished and cyanided to give them a better appearance. One should compare these clamps with the common table clamps which are made originally for one job. The clamp generally starts its life with one hole about 2 in. from the end and later it is found with a number of holes irregularly located and pretty well bent out of shape and battered up. It would be difficult to distinguish it from its sister clamps which are thick and thin, long and short.

The bolts are all made of cold rolled steel and heat treated. The hardening of the bolts shows a saving on the threads as the average workman will continue to tighten up a nut until he feels the threads stripping. Broken threads are seldom experienced with these bolts except with new men and this happens very seldom. All the nuts are semi-finished and hardened.

In most shops, when a new feature is introduced, it is looked upon with suspicion and although the gain by its use is evident, it is not always acceptable and for this reason the introduction of the clamps was carefully worked out and great care was taken in the small details. Special racks were made to hold the clamps and each department has its own racks and an ample supply of clamps. Each style of clamp has a certain place in the

rack. Every effort was made to convince the foreman and workmen that it was not necessary to guard their property jealously, as there were sufficient clamps in the rack to take care of all the work and more could be obtained on requisition from the storekeeper. The object of this was to prevent the workman from saving and hiding the ones he used at his machine but instead to persuade him to return them to the rack when he had finished using them. Each rack contains a sign, "Please wash clamps when through using and put in right place." A small can of gasoline is kept near the rack to wash the clamps and the bolts are always removed from the clamps before placing in the rack.

A regular metal bolt rack is also used for the bolts which shows at a glance the different sizes. A small sign is hung on this rack which reads, "Place nuts on bolts when through using and put in proper place." Very little difficulty was experienced with the workmen's not placing the clamps in the proper rack. This is part of the discipline of the department and is watched by the foreman. Each Saturday a general inspection is made and all outstanding equipment is returned to the proper place and the racks are straightened up and cleaned.

It would be difficult to tell of the many advantages of using a standard equipment of this kind with a regular place to keep it. The saving is at once noticeable and the great number of possible combinations gives an opportunity to make a quick and economical set-up at all times. Very often a temporary jig is constructed with these clamps which alone saves their cost. This equipment has been in use over a year and it has not been found necessary to alter the standards adopted at the start or to increase the number of designs. It is another proof that the little things—the minor details—should be watched and the big things do not need this minute attention.

A party of 125 students, from the engineering college of Purdue University, Valparaiso, Ind., spent two days in Milwaukee last week to gather practical instruction in the machinery plants. The Citizens' Business League entertained them at a banquet. Prof. C. W. Benjamin, dean of the school, headed the party.

German Standard Sizes of Semi-finished Steel

We are officially advised that the standard sizes of semi-finished steel of the Stahlwerks-Verband (German Steel Syndicate) are as follows:

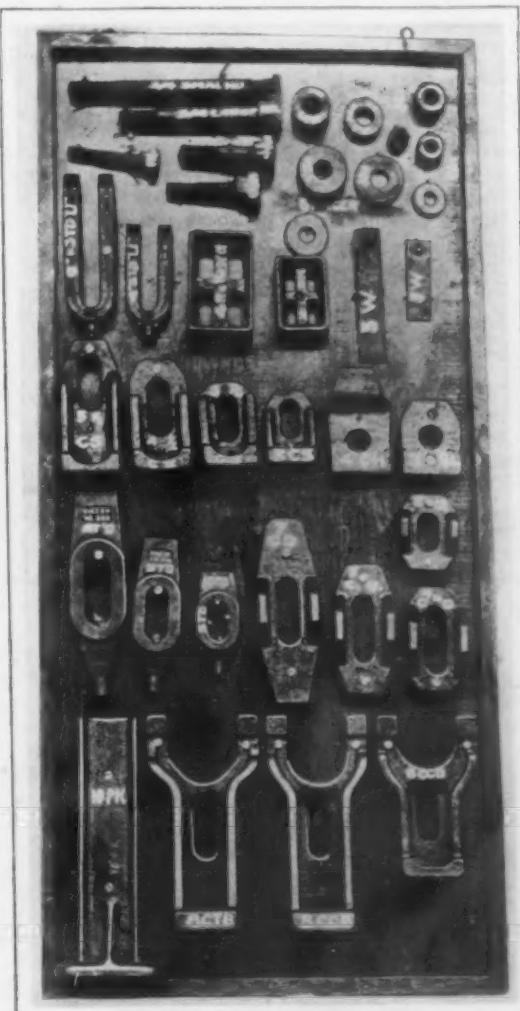
For billets, 2 in. to 4 in. square, 1 to 10 meters (3.28 ft. to 32.8 ft.) in length.

For blooms, $4\frac{1}{2}$ in. to 400 mm. (15.88 in.) square, and not more than $3\frac{1}{2}$ tons in weight.

For slabs, 6, 8 and 10 in. in width.

For sizes exceeding those named, special prices are made.

The Rogers-Brown motion picture exhibition, "From Mine to Molder," was given last week at Milwaukee under the auspices of the Milwaukee Metal Trades & Founders' Association. Plankinton Hall of the Milwaukee Auditorium was crowded to overflowing. Theodore O. Vilter, president of the association, acted as chairman. Henry B. Yergason, lectured on the pictures.



Mounted Group of the Standards

Heat Treated Gears in Machine Tools*

Economic and Practical Questions Regarding Alloy and Other Steel Gears Considered at Length by the Machine Builder

BY ANDREW C. GLEASON†

The methods of heat treatment described here are those best suited to our requirements at the Gleason Works; it is not claimed that they represent the general practice. In fact, it is rather hard to say what is the general practice, as the heat treatment of steel gears is largely a matter of individual requirements. Methods vary considerably even among manufacturers of a certain class of automobile gears which are of a standard shape and designed for one purpose, so that hardened gears for machine tools may well be considered a proposition distinct in itself.

Looking at this subject from the point of view of the machine tool builder, the principal matters to be considered are:

The advantages to be gained in the use of heat treated gears;

The selection of steel to suit the purpose for which the gears are intended, and the design to suit hardening conditions;

The methods of hardening and the necessary equipment and materials;

The cost of heat treated gears.

The Advantages of Using Heat Treated Gears

The advantages in the use of heat treated gears properly made are greatly increased strength and hard tooth surfaces, which resist wear. These points are certainly of vital importance in modern machine tool design and it seems inevitable that hardened gears will very soon be in general use in this class of machinery. The failure of soft metal gears to stand the wear and tear in machine tools is too frequently the cause of breakdowns and in spite of the rapid development in design in other ways, such gears are still commonly used. They are a serious source of weakness and the logical remedy is heat treated gears.

Heat treated gears with their increased strength and ability to withstand wear offer almost unlimited opportunity for compact design. For an example of this, the automobile transmission suggests what can be accomplished with such gears in making machine tools more convenient in operation and more durable.

The Selection of Steel for Gears

The question of steel depends not only upon the purpose for which the gears are intended but also upon the design. When the gears are subjected to severe shock or heavy overload at times, a steel which will show the greatest tensile strength, without sacrificing toughness, is plainly the most desirable. But steel which will show these qualities has certain limitations for use in machine tool construction and it will be interesting to note the value of this—a straight tempering steel—as compared with the more commonly used case hardening steels.

Straight tempering steels for gears are invariably alloy stock and most of our experience has been with the chrome nickel alloy. With several different makes of stock of this kind, we have found an increased tensile strength after heat treatment of 150 per cent. The analysis varies considerably in different makes, requiring a corresponding difference in the heat treatment, but manufacturers making a specialty of alloy steels now furnish them carefully graded with instructions for hardening which can generally be relied upon.

Methods of Hardening in Relation to Design

There are frequent exceptions to the rules for harden-

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†Gleason Works, Rochester, N. Y.

ing of any kind of gear steel and the only safe method is to experiment with every change in design. It is not sufficient to cut a piece off the bar and harden it regardless of the shape of the gear you are making, as the sample piece should be practically the same as the gear in order to produce the same effect.

Take for example a pinion solid on a shaft as shown in Fig. 1 herewith. The teeth will chill much more quickly than the solid section under them and in order to avoid shrinkage strains on this account, special heat treatment is required to suit this shape and the quality of steel that is used. If a sample pinion of this size were made separate from the shaft, the effect of the same heat treatment would be radically different, owing to the fact that the center would cool almost as rapidly as the teeth.

Our experience leads us to recommend the use of as few grades of steel as possible. If the steel is selected to suit exactly each different shape of gear and the purpose for which it is intended, it would lead into a large variety in such varied requirements as the machine tool builder has. There are some steels which are more adaptable to different conditions in hardening than others and considering the comparatively small quantities and the variety of sizes and shapes in gears for machine tools, it is well to keep this in mind. Fool-proof methods in the heat treatment of gears are far from possible, but by the selection of a few grades of steel which show good average results, the work can be greatly simplified.

The Suitability of Alloy Steel Gears

On account of the great strength and toughness of chrome nickel tempering steel and the fact that it hardens clear through, it is well adapted for automobile transmission gears and any similar purpose in the construction of machine tools. Gears of this kind do not chip on the edges of teeth and will stand almost unlimited hardship in sliding in and out of mesh. Chrome nickel tempering steels tend to keep their shape in hardening better than the low-carbon case-hardening steels, but they do warp to some extent and they cannot

be straightened without sacrificing the hardness almost entirely. Gears made of this stock do not show so hard a bearing on the surface of teeth as those made of case-hardened steel. The cost of machining alloy tempering steels will average at least twice as much as that of case-hardening steels, and the cost of the steel itself will run 14 to 16 cents per pound as compared to less than half of that price for high-grade alloy case-hardening steels.

The chief advantage in the use of case-hardened gears is the file-hard tooth surfaces. The easy machining qualities and low cost of the stock are important advantages, also, but the superior wearing qualities make it the best at any price for average conditions in gears for machine tools.

In designing a machine tool from the ground up there may often be occasion to make the gears as small as possible for the purpose, and it then becomes a close question as to the choice of tempered steel or alloy-case-hardening steel. The use of 5 per cent. nickel low-carbon case-hardening steel will give the best results possible—strength and wearing qualities considered—although if strength is the main issue, tempering steels, as previously explained, must be the choice.

Of the alloy case-hardening steels we are more familiar with the three principal grades of nickel than any other. I believe that these have become, to a large degree, standard in the trade at the present time. These are 5 per cent. open-hearth nickel alloy, 3½ per cent. open-hearth nickel and 1 to 1½ per cent. nickel natural alloy, all of which must be

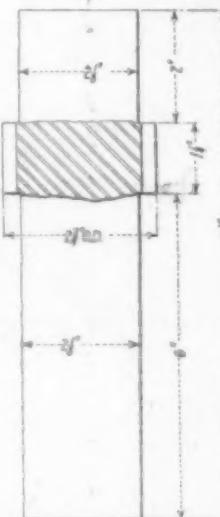


Fig. 1—Pinion solid with a shaft; 20 teeth; 2 1/2 in. pitch, 1 1/2 in. pitch diameter

more or less familiar to you. The principal characteristics of these steels are a higher tensile strength than straight carbon steel to start with, and a correspondingly higher strength after case-hardening. The carbon case has a close bond with the core and is less liable to chip than the ordinary machinery steel. In fact a number of manufacturers of the higher grade automobiles use a 5 per cent. case-hardening nickel steel in their change speed transmissions, where the argument might be claimed in favor of tempering steels.

The Gear Suitable for the Machine Tool

When it comes to substituting case-hardened gears for soft steel or cast-iron gears in machine tools, however, it will generally be found that a straight carbon case-hardening steel will answer every requirement; as, unless the original gears have been considerably overloaded, the more expensive alloy steel gears would be an extravagance. In straight carbon steels for case-hardening we recommend 0.15 to 0.25 carbon. A lower grade of carbon than this is quite likely to produce a laminated case which will crack or chip under heavy pressure.

Nickel alloy steel for carbonizing should not run over 0.20 carbon; 0.10 to 0.20 carbon suits us the best. The nickel alloy has practically the same effect in hardening as an increase in carbon of about 10 points. We have found that 0.25 carbon nickel alloy steel case-hardened will generally harden clear through very much the same as a straight tempering steel.

The teeth of soft steel gears in machine tools seldom break or strip until they have worn quite thin and our experience goes to show that durability is generally of more importance than excessive strength in gears of this kind. Case-hardened steels show an increased tensile strength ranging from 30 per cent. in standard carbon steel to 75 per cent. in high-grade nickel alloy steel.

The straight carbon case-hardening steels do not run as uniform in analysis as the alloy steels and we cannot always get the same degree of hardness in the case as with the higher grade steels. This is particularly noticeable in gears of heavy section hardened in oil, but it rarely happens that the hardness will drop as low as that of tempering steels. A strong point in favor of case-hardening steels for machine tool gears is that certain parts can readily be kept soft where it is found desirable for subsequent fitting. Hub projections, web surfaces, etc., can be copper plated or enameled with various preparations so as to stop out the carbon in the carbonizing heat, leaving these parts perfectly soft for final machine operations, according to the usual practice in this class of work.

Copper Plating Used in Selective Hardening

Present day design of case-hardened gears for machine tools often makes it necessary to keep certain parts soft in order to avoid shrinkage strains in the hardening process. In a gear with light hub projections, as shown in Fig. 2 herewith, the carbon case would extend almost through the thin section of the hub at the keyseat, making it quite likely to crack on account of the uneven shrinkage in hardening. We advise making gears of even section throughout for hardening, but where it is necessary to use light hub projections like this, they can be made safe by this method of selective hardening.

In selective hardening we have found that copper plating the surfaces which are to be kept soft is the most satisfactory method. Generally the parts to be plated can be immersed in the solution leaving the teeth clear. Or the blank can be copper plated all over so that when the teeth are cut the bearing surfaces will be free to carbonize. It should be borne in mind that wherever this plated surface is marred carbon will enter and leave a hard spot

after the gears are hardened, at a point not wanted.

Other points for criticism in the design of this pair of gears are the extremely long face in proportion to the cone distance and the long backing or overhang of the pinion on its bearing. The chances are all against getting a full bearing of the teeth throughout the length of face after the gears are hardened and the bores are ground to size. We would advise cutting down the length of face to not more than one-third of the cone distance and using a coarser pitch with a smaller number of teeth for the same diameters.

Another condition which it is necessary to guard against in gears of this kind occurs where a small pinion is made solid with the gear in place of the light hub, as shown in Fig. 3. There would be still greater risk on account of shrinkage strains in hardening this piece. The pinion section would naturally be weak when worked out of the center of bar steel or a solid forging, and all considered it would be far better to make it separate from the gear.

Transmitting Power of Gears

All established rules for horsepower of gears as far as I know are based on the use of soft steel or cast iron. They usually allow a stress for steel of $2\frac{1}{2}$ times that of cast iron. This may be correct as far as strength is concerned, but it certainly is not right if wear is to be taken into account. We have found

that gears of a good mixture of cast iron, showing 35 to 40 on the scleroscope test for hardness, will withstand wear fully as well as open-hearth cast-steel gears of the same size. Consequently we have compromised on one-half this difference in stress for steel, making it $1\frac{1}{4}$ instead of $2\frac{1}{2}$ times that for cast iron.

This brings up the subject again of wearing qualities of case-hardened steel gears as compared with soft gears. We have equipped a number of electric motor drives with case-hardened gears, making them very much smaller than the soft steel gears formerly used, with most satisfactory results. And judging by these records, we recommend a stress of four times the usual standard allowed for cast iron in standard

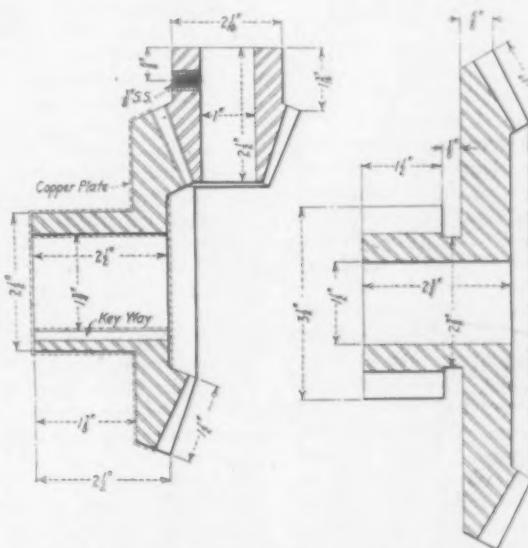
horsepower rules, such as the Lewis formula.

For example, in a 30-hp. electric motor drive in connection with a positive pressure blower, which we have in use, the original soft steel gears, computed according to our standard rule for horsepower, required a pair as large as of 49 and 16 teeth of 3 diametrical pitch and $3\frac{1}{4}$ in. face, and the case-hardened steel gears which we have had in use now for several years are of 49 and 16 teeth, 4 pitch and $2\frac{1}{4}$ in. face! We consider this rating—four times greater than cast iron—is conservative as the gears which we have based our calculations on are considerably larger than automobile bevel driving gears.

The Favor Toward Case-Hardened Gears

As evidence of the advantage of case-hardened gears over alloyed tempered steel gears, we may cite the standard automobile practice in beveled driving gears. I do not know of a single exception to the rule that automobile manufacturers use only case-hardened steels for such beveled driving gears at the present time. Their requirements, as you know, call for durability and strength.

We recommend quenching case-hardened gears at the lowest heat possible to produce the requisite degree of hardness; this in combination with slow carbonizing heats gives excellent results with one quenching heat. In the use of steels suitable for case hardening, we strongly advise against drawing after hardening. We find that case-hardening steels allow of a much wider range in the heat treatment than tempering steels, and we consider case-hardened gears the best for general purposes in machine tools, clash gears excepted.



Figs. 2 and 3—Bevel gears to illustrate the hardening problem

The Gleason Works Hardening Department

I am showing herewith assembly drawings of the equipment in our hardening department. We are using coal-burning furnaces for carbonizing on our work, in preference to oil or gas, as we believe for good and sufficient reasons. For continuous use with the slow soaking heats, which we recommend, we find coal to be the most economical; and with very little attention to the fires, we find no difficulty in maintaining and controlling the heat. The fact that the coal-burning furnaces require practically no attention when run after working hours, and that no power is required for air pressure, such as is necessary in the oil or gas burners, is an argument in their favor; and the very low cost of fuel is an important consideration also. Furnaces of this kind, however, must be used continuously, day after day to produce the best results, since it requires about 24 hr. from the start to bring them up to a carbonizing temperature.

On the other hand, there is no delay whatever in getting the required heat with oil or gas, and where there is not sufficient work to keep a furnace running continuously, the oil or gas furnaces would undoubtedly prove the most satisfactory. An oil or gas furnace is necessary in any case for re-heating, so that the same furnace can often be used to advantage on carbonizing as well. Aside from the cost of fuel, the objections we have to the use of oil or gas for carbonizing on our work are that furnaces of this kind require constant attendance when run after working hours and extra power is needed for air pressure in the burners. There is always the danger of an interrupted flow of the gas or air to be guarded against.

Most of our work requires the use of large carbonizing boxes and these naturally require a longer time to penetrate than smaller sizes. In regard to the depth of carbon case in gears, we recommend one-eighth of the thickness of teeth at the pitch line, and not more than $1/16$ in. deep in the coarsest pitches in machine tools. According to this rule, $1/32$ -in. pitch should have a $1/32$ -in. carbon case.

At the present time, there are several makes of carbonizing compounds extensively used which have proved much more satisfactory than bone or charred leather; and while elaborate reports on the results of the use of these various compounds have been published, which furnish all the necessary information required, we shall be very glad to explain our more limited experience with them to any one who may be interested. Care must be taken to keep these compounds perfectly dry, not only in the packing of the boxes but also after they are taken out to cool; if any water is allowed to leak in when the material is hot a chemical action sets up which has the effect of blistering the case-hardened surfaces on the gears, as though they were overheated. Short pieces of common machinery steel about $1/2$ in. square are generally placed in the top of the boxes for test pieces, and before the work is taken out of the box these pieces should be hardened and broken to make sure that the depth of case is right. It is a well-known fact that nickel alloy steels require a longer carbonizing heat than straight

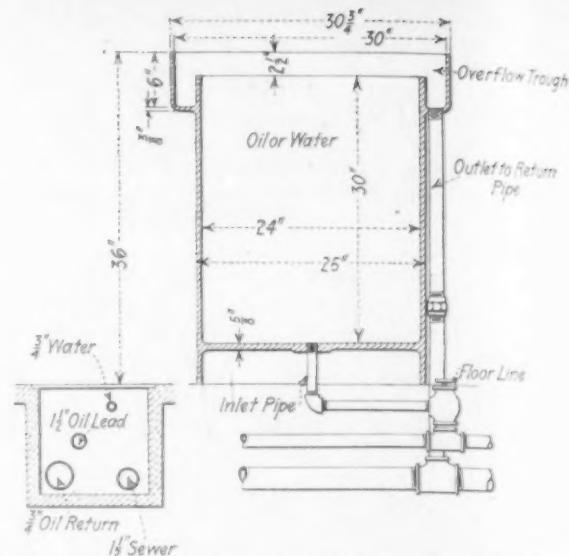


Fig. 5—Sectional elevation of an oil or water-quenching tank, a line of which lies over a trench containing the piping

carbon steel, and in order to get a line on the proper depth of case, test pieces of the same material should be used along with the plain carbon steel test pieces to make a proper comparison. We find that it does not pay to use plain cast-iron carbonizing boxes. Semi-steel is better and cast steel is best.

The Oil for Quenching

We use mineral oil for quenching which has a 310 deg. flash test and viscosity of 74 at 104 deg. It is a thin petroleum oil which can be bought for 17 cents per gallon by the barrel. With tempering oils like this, we find that a safe rule is to quench 1 lb. of steel to a gallon every 4 hr., where no special arrangements are made for cooling the oil. With our cooling system we are able to quench 3000 lb. of steel in 8 hr. with 700 gal. of oil. The tempering oil as shown in Fig. 6 is circulated through the inside of a radiator and we circulate our fuel oil through the outer jacket. The radiator is simply a power house water heater which is adapted to this purpose without change. We use the fuel oil for cooling because of its convenience. Greater efficiency, of course, could be obtained by having a flow of water for the purpose or by increasing the radiating surface. Our radiator has 30 sq. ft. of cooling surface.

We have never had any difficulty with over-heating of

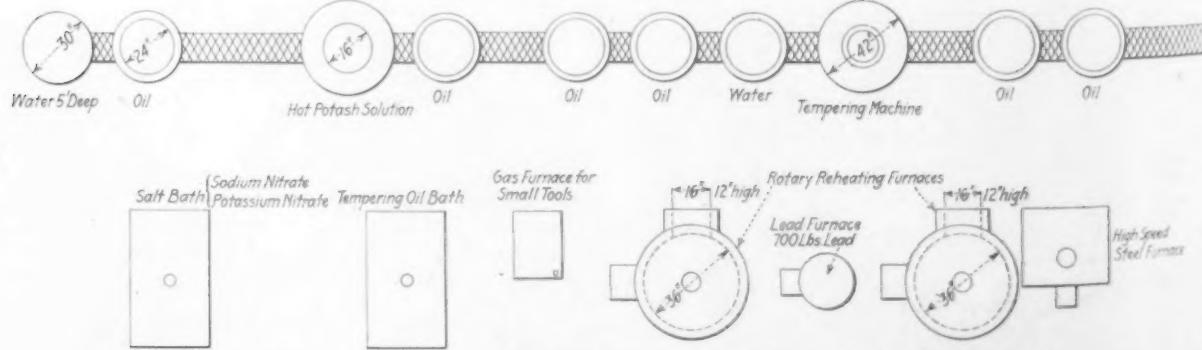
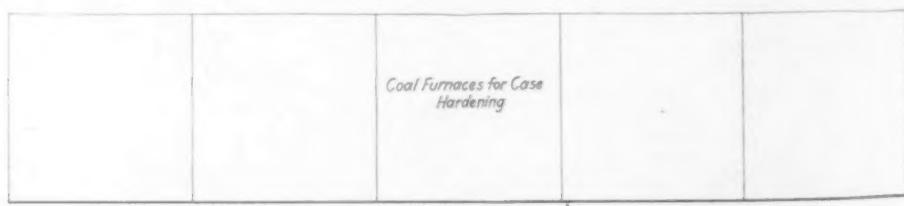


Fig. 4—Plan of the heat treating and hardening department of the Gleason Works, Rochester, N. Y.

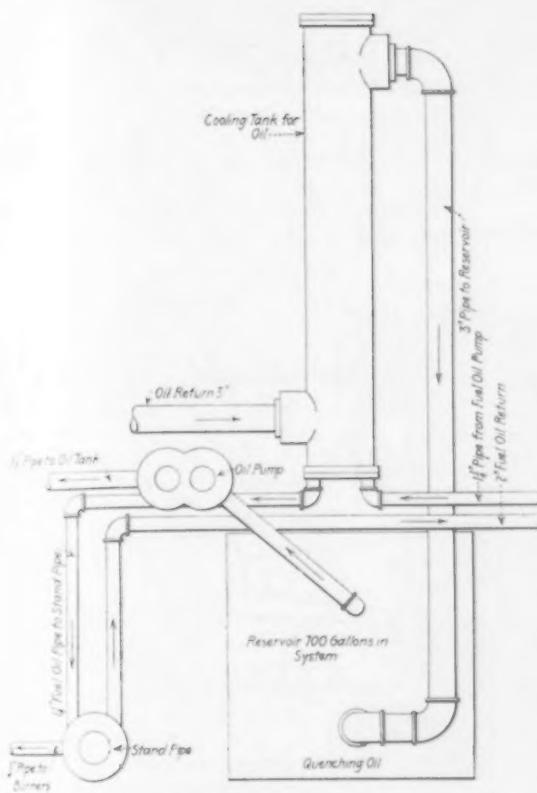


Fig. 6.—Plan of reservoir for quenching oil and the oil cooler. The oil for quenching is cooled by oil which is to be used for fuel purposes. The oil fuel is delivered by the fuel oil pump, not shown, through the cooler and thence to a stand pipe, from the bottom of which is taken the branch to the burner and at the top of which is an air vent.

the oil with this system, no matter how fast the work is put through; it runs up occasionally to 120 deg. but never any higher. We figure on quenching about twice as fast as we could without the cooling system.

The Cost of Heat-Treated Gears

In leading up to the final cost of heat-treated gears, we submit herewith an itemized form—our actual cost of labor and materials in the heat treatment of chrome nickel tempering steels as compared with case hardening in general.

Taking 1000 lb. of gears in chrome nickel tempering steel, we have:

Labor (one working foreman and two assistants—wages)	\$9.85
Fuel oil (two hardening furnaces—60 gal.)	3.00
Quenching oil—1½ gal.	.25
Tempering oil—2 gal.	.50
Pyrometer ends	.10
Gas for drawing temper—1500 ft.	1.45
	\$15.15
Cost per lb., cents.	1.52

For 1000 lb. of case hardened gears:

Labor (one working foreman and two assistants—wages)	\$9.85
Coal (3 furnaces—200 lb. each)	2.00
Carbonizing compound	1.00
Fuel oil (two hardening furnaces—60 gal.)	3.00
Quenching oil—1½ gal.	.25
Pyrometer ends	.25
Carbonizing boxes (average)	2.50
Wear and tear on 3 carbonizing furnaces	.30
	\$19.15
Cost per lb., cents.	1.92

I am also showing herewith a tabulated account of our actual cost of labor and materials in making up from bar stock a small lot of miter gears complete using the various grades of steel referred to. We have found the cost of machine work practically the same in either case-hardening straight carbon steel or any of the nickel alloy case-hardening stock. I believe that these figures explain themselves and any further comment seems unnecessary.

Taking a miter gear, 18 teeth, 4 pitch, 1½-in. face, 1½-in. bore, ordinary hub

11 lb. rough bar stock,
5½ lb. finished.

Our labor cost of machine work would be practically the same for this gear in any of the standard steels for carbonizing. The only difference in the cost complete would be in the stock. According to this, and taking the labor cost at \$1.00, the gear complete in

Straight carbon steel at 3c. would be.....	\$1.44
1-1½ per cent. natural alloy steel at 4½c.	1.61
3½ per cent. open-hearth nickel steel at 6c.	1.77
5 per cent. open-hearth nickel steel at 8c.	1.99

Our labor cost of machine work of the gear in chrome nickel crucible tempering steel would be.....	\$2.00
Heat treatment .....	.09
11 lb. at 15c.	1.65
	\$3.74

Heat-treated gears in machine tools are on the side of superior quality and greatest efficiency. Therefore, they represent the standard and aim of American manufacturers. It is safe to say that within the next few years soft steel gears in machine tools will become a thing of the past just as gears with cast teeth were abandoned twenty years ago.

Operations at the Baldwin Locomotive Works

The Baldwin Locomotive Works, Philadelphia, reports a steadily decreasing volume of business. During the first half of the year this company employed up to its maximum of 19,500 workmen, decreasing early in the summer to 18,500. Since then the decline has been gradual and now but 13,000 employees are on its rolls. An officer of the company states that the plant will probably operate on a 50 per cent. basis during the winter. At its new Western plant in the vicinity of Chicago, the sewage, foundation and underground work has been practically completed but the erection of the new buildings will be held in abeyance until business conditions warrant the continuance of the construction of the plant. Recent orders taken by the Baldwin Works include 10 engines for the Lehigh & New England Railroad, and 14 engines for the Mobile & Ohio.

Snyder Electric Furnaces.—The Metallurgic Engineering Company, Monadnock Bldg., Chicago, has issued its first electric furnace bulletin. This bulletin describes the Snyder system electric furnaces, the various advantages of which are explained in detail and illustrated with detail photographs of installations. Its manner of operation, its particular characteristics, its economies and a table of costs of electric melting are given in the bulletin. The matter is presented in a way that brings out the salient features of an electric furnace installation briefly but very clearly.

The Standard Motor Car Company, Minneapolis, Minn., has been organized with a capital stock of \$6,000,000 as a result of the merging of the Colby Motor Company, Mason City, Iowa, and the Minneapolis Motor Company, Minneapolis. The new corporation contemplates the building of an immense new plant at Minneapolis, on the completion of which the present plants at Mason City and Minneapolis will be disposed of. It will manufacture pleasure cars, light delivery trucks and motorcycles. Among those interested in the merger are F. E. Kenaston, president, Minneapolis Threshing Machine Company; M. J. Scanlon, Brooks-Scanlon Lumber Company; S. B. Bowman, Bowman Lumber Company, and C. H. McNider, president First National Bank, Mason City.

Arthur G. McKee, engineer, Cleveland, Ohio, has taken an order from the Nicopol-Mariopol Mining & Mfg. Company, for a new skip and distributor for a blast furnace of that company at Sartana, Russia. Several months ago this company rebuilt one of its blast furnaces and gave Mr. McKee an order for a skip and distributor for that stack. The present order is a duplicate of the former one.

The Frederick Cowin Company, which has been operating a bar-iron mill at Joliet, Ill., formerly controlled by the Joliet Rolling Mill Company, is about to build an addition to the mill, 67 x 216 ft. The new construction will be of steel and concrete and will house a new 16-in. mill with two additional furnaces.

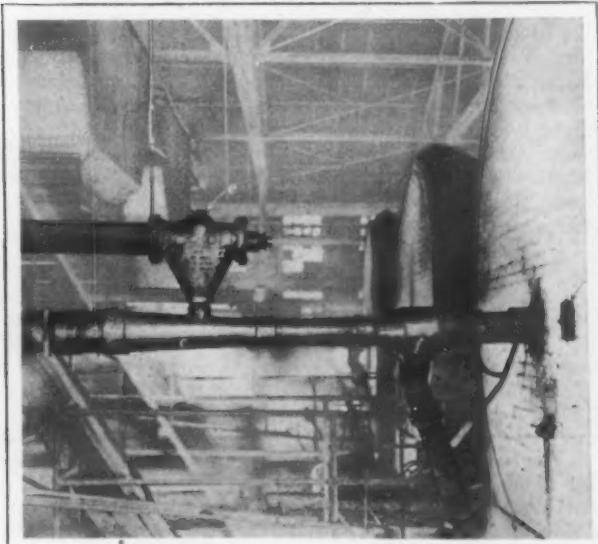
Improved Pulverized Fuel Feed Device

An Apparatus for Securing Uniform and Correct Mixture of Air and Fuel

W. R. Dunn, Phillipsburg, N. J., superintendent of the Vulcanite Portland Cement Company, Vulcanite, N. J., has perfected a fuel feeding device for burning pulverized coal which has proved of such value in connection with the rotary kilns used in cement making that he has adapted it to furnaces and heat generative chambers where pulverized fuel, gas or oil can be used. In the kilns referred to, it is declared that a perfect mixture of air and fuel has been secured, and therefore a uniform and maximum combustion. The details of the device, which has been employed also in nodulizing iron ore and in a small stationary furnace, are of interest in the utilization of pulverized fuel.

As will be seen from the accompanying halftone and drawing, the general appearance of the Dunn device as applied to a rotary cement kiln is similar in design to well known types. From a large hopper the fuel is carried by the usual screw conveyor to the cone-shaped casting (a). Having reached this point the fuel does not drop unrestrained, but is partly carried over an adjustable grid (b), which breaks the masses of coal dust and causes it to fall in a fine shower into the tube (c) in which it is carried by the air blast into the kiln. The air blast nozzle (d) is partly supported by a trunion bearing by which it can be made to advance toward or recede from the opening in the cone-shaped chamber which supplies a means of regulating the effect of the blast. Further regulation can be secured by manipulating the cap (e) at the top of the cone-shaped casting which controls the admission of air.

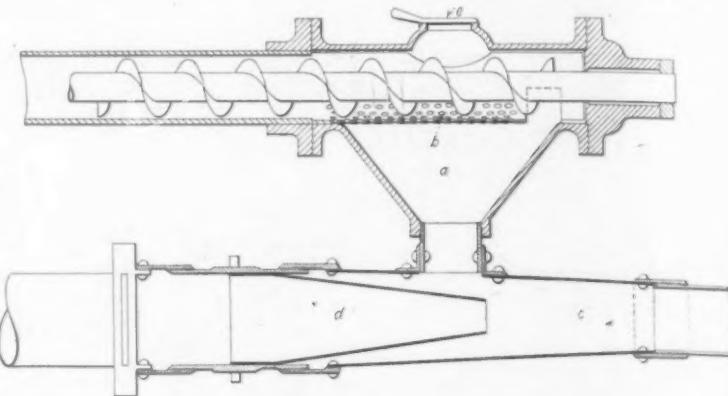
As used with a rotary cement kiln, and as shown in the halftone, there is a second intake of air through a device called a heat recuperator (f) which draws heated air on the injector principle from the hot clinker pit on one side of the kiln. This heated air, of course, not only assists combustion, but conserves the heat already created. With the apparatus a heat of 2500 to 2800 deg. F., can be maintained in the fire zone of the kiln which is operated night and day. An examination of the end of the burner, which enters the kiln at the center horizontally, but not vertically, to permit of a better combustion of the gases, demonstrates that the coal, which is discernible as a flickering shadow at the end of the burner, travels very little distance before it is consumed. When the flame is inspected through the opening (g) its evenness of intensity is marked, which is pointed to as visual evidence that the flame is diffused in a manner that would cause it to reach every part of a chamber of appropriate size and does not impinge upon a small area.



Dunn Pulverized Fuel Feeding Device Applied to Rotary Cement Kiln

In a report on the operation of the device in cement making, S. W. Hartwell, chemist, Easton, Pa., has gone into the conditions which must be avoided in burning pulverized fuel, all of which he finds are obviated by the Dunn device. The report, while it deals with a test conducted in a cement plant, applies, so far as the question of perfect combustion is concerned, to consumption of pulverized fuel generally. In part Mr. Hartwell says:

"It feeds the coal into the kilns in an even stream, uniform in quantity at all times. The air entering the



Details of Improved Device for Burning Pulverized Fuel

kilns is constant in quantity and the total amount is sufficient to insure perfect combustion of the coal with any style of burner, but it is a well known fact that the coal must be introduced in as uniform a stream as the air. If such is not the case, even for a few moments, and the stream of coal is greater than the air entering during the same period will consume, this excess of coal passes through the kiln unburned and wasted; then in the next few moments there will be a deficiency of coal equal to the previous excess and there will be an amount of air passing through without being utilized in combustion, which air takes up, carries away and wastes heat. In other words it is not enough that the total amount of air and coal entering the kiln be proportioned to each other, but it is also necessary that each particle of coal be mixed with and enter the kiln simultaneously with the required portion of air."

In the nodulizing of iron ore it has been used by the Carolina Ore Company, Winston-Salem, S. C. It has been applied also to furnaces where the fuel consumption was as low as 50 lb. of pulverized coal per hour, 95 per cent. passing 100 mesh standard sieve.

Detroit Foundrymen's Meeting

The members of the Detroit Foundrymen's Association who attended the convention of the American Foundrymen's Association at Chicago, October 14 to 17, decided to capitalize the interest aroused by the convention exhibits and papers by devoting their meeting of November 13 to a discussion of what they saw and heard. The following topics will be taken up by the members mentioned: "Sand and New Sand-handling Devices," by T. A. Leyshon, H. M. Lane Company; "Molding Machines," by James F. Miller, Ford Motor Company; "Core Room Equipment," by H. M. Lane; "Sand Blast and Cleaning Room Equipment," by A. F. S. Blackwood, Michigan Steel Casting Company. Of the papers presented at the Chicago convention, that of J. J. Wilson, Cadillac Motor Car Company, will be re-read at the same meeting.

At a recent meeting of the British Association the impression that metals become crystalline through fatigue was repeatedly rebutted and Dr. Rosenhain in a lecture insisted that a metal is necessarily always crystalline. The difference was that in an ordinary tensile fracture the crystals were first elongated until the fracture looked fibrous, while under fatigue they were broken through without being stretched, and thus exhibited a crystalline appearance.

The Open-Hearth Furnaces at Midland, Pa.

And the Billet Rolling Mill of the Pittsburgh Crucible Steel Company—Merchant, Axle and Plow Mills to be Built

(Map of the Works on Supplemental Plate)

A notable addition to open-hearth steel capacity in the Central West has been furnished by the completion of the new open-hearth steel works of the Pittsburgh Crucible Steel Company at Midland, Pa. It was built primarily to furnish billets for the finishing mills in the Pittsburgh district of the parent company, the Crucible Steel Company of America, which has a number of works in Pittsburgh and in the East for the manufacture of high-grade tool steels, merchant steel bars and specialties. In short, the company desired to strengthen its position by having its own supply of steel, instead of having to buy it in the open market as has been its custom. The Pittsburgh Crucible Steel Company was organized in 1910, and on March 1, 1911, it acquired the blast furnace, coke ovens and property at Midland, Pa., owned by the Fownes interests of Pittsburgh, the blast furnace having been operated under the name of the Midland Steel Company of Pittsburgh. This property was made the nucleus of the new open-hearth plant. Also on March 1, 1911, John W. Dougherty, for some years general superintendent of the Pennsylvania Steel Company at Steelton, Pa., resigned to become president and general manager of the Pittsburgh Crucible Steel Company, and the development at Midland has been under his supervision.

The Furnaces, Gas Producers, etc.

The open-hearth furnace building, which is 984 ft. long,



172 ft. wide and 60 ft. high to the bottom chord of the roof trusses, contains eight 60-ton furnaces, six basic and two acid, and provision has been made for building two more. It is the intention to use molten metal in the near future, and for this purpose a 500-ton electric-tilting mixer has been installed by the Mesta Machine Company, Pittsburgh. It will be operated by two 105-hp General Electric 230-volt motors, controlled by automatic Cutler-Hammer switchboards. From the mixer the metal will be poured into 50-ton ladles, at the same time being weighed by a Fairbanks register beam. The ladles will be transported by a 75-ton Alliance four-girder type crane with 80-ft. span, and then distributed into the different open-hearth furnaces. The first steel was successfully poured on August 4, and at this writing six of the eight furnaces are in operation. When the eight furnaces are in operation, the plant is expected to make 32,000 to 35,000 tons of billets and slabs per month.

The doors and reversing valves for the furnaces are operated by means of Caskey simplex hydraulic valves, built by the Yarnall-Waring Company, Philadelphia. Natural gas is used at present, measured by Westinghouse proportional gas meters, but Hughes gas producers are also being installed, in case of a shortage of the natural gas.

The scrap material used in the furnaces is stored in a



Near-by View of the Pouring Side of the Open-Hearth Furnace Plant

stock yard adjacent to the furnace building, having a crane runway 902 ft. long of 100-ft. span with 29 ft. height to the top of the running rails. It is handled by two 10-ton three-motor Morgan stock cranes, equipped with 62-in. Cutler-Hammer magnets. Solid cast-steel boxes, placed on cars of special design, four boxes to the car, are used for charging the scrap into the furnaces. The cars are hauled by shifting engines to the open-hearth charging floor, which is about 55 ft. wide. The furnaces are served by two 5-ton four-motor Morgan floor-type charging machines. The limestone, ore, etc., which is stored in overhead bins in the stock yard, are loaded into similar cast-steel boxes by means of chutes, and hauled also by the switching engines to the charging machines. If cold pig iron is used in the furnaces it is similarly handled, but if molten metal is used, it is supplied from the 50-ton ladles as explained. The spiegelisen, ore and ferrromanganese are stored in concrete bins at the south end of the open-hearth building, located on the yard level. This material is loaded into these bins by chutes from cars above on the charging floor. When needed at the furnaces it is taken from these bins by means of a 5-ton Alliance two-rail traveler, operating inside of the large crane runway.

The scrap drop is located in a building 50 ft. high with 75 ft. span and is 100 ft. in length. It is equipped with a Morgan standard crane of 25 tons with a 15-ton auxiliary hoist. The ball is a steel casting, 54 in. in diameter, weighing about 12 tons, and is handled by a Cutler-Hammer 62-in. magnet, having special centering shoes, which pick the ball up from any position and hold it centrally.

The spouts on the pouring side of the furnaces are handled by Whiting 6-ton standard electric jib cranes. For the molten steel ladles there are two 150-ton four-girder Alliance cranes, each equipped with a 25-ton auxiliary hoist. There is also a 10-ton standard Morgan crane on the pouring runway for general service, and for repair work there is a 7½-ton Northern Engineering crane traveling on a monorail suspended from two 15-in. I-beams, which circle the entire building. The ingots cast range from 18 x 20-in. size, weighing about 3 tons, to 32 x 32 in., weighing about 8 tons, the size of the ingots depending, of course, on the sizes of the billets and slabs to be rolled on the blooming mill. Some of the steel is bottom poured in the mold, as when high-grade steel is being made. For storing of molds there is a crane runway 222 x 67 ft.

The gas-producer buildings which are being erected provide for 16 Hughes producers. The producers are being housed in groups of four, and each house serves two furnaces. The producers were built by the Wellman-Seaver-Morgan Company, and provision is made for producer houses to take care of 12 furnaces. Between each pair of producer houses it is planned to accommodate two 400-hp boilers to utilize the heat from the waste gases of the furnaces.

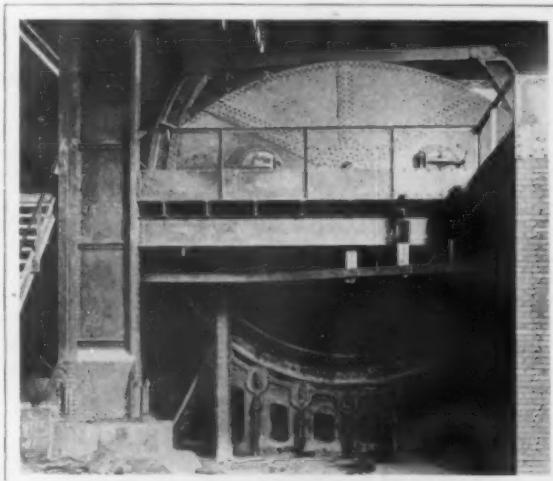
The coal for the gas producers is hauled in standard gauge cars and dumped into two concrete bins. From the bins it is taken by link-belt elevators to overhead steel bins, and from these it is delivered to an Atlas electric-driven coal larry which supplies the hoppers over the gas producers, being weighed automatically before it discharges. The ashes from the gas producers are handled by electric-driven ash cars, furnished by the Orenstein-Arthur Koppel Company, Pittsburgh, and the cars are dumped into a link-belt skip hoist which lifts the ashes into an overhead concrete ash bin delivering to coal cars. The ashes are used in part for filling purposes. The skip cars are operated by a Cutler-Hammer automatic push-button controller, and have a capacity of 140 tons in 10 hr. The gas-producer houses were designed by the company, and all flue work between the gas producers and valves was erected by R. Munroe & Sons Mfg. Company, Pittsburgh. There are at present four gas-producer buildings, each 72 ft. in length from center to center of the end columns and 25 ft. in height.

The calcining building is 143 ft. 6 in. from center to center of end columns and 60 ft. wide, and 41 ft. high, with a lean-to of 16 ft. The material is carried into the building over the same tracks that serve the ore and coke bins. It is equipped with two 8-ft. wet pans and one 9-ft. dry pan, a Dodge crusher, two cupola calcining furnaces, and the necessary conveyors, buckets, etc. The crusher is driven by a 30-hp General Electric motor, and a 10-hp motor drives the conveyor, which is of the Link Belt Company's bucket type. The two cupolas are served by a Sturtevant fan driven by a 15-hp semi-enclosed motor. The cupolas are charged from buckets which are loaded at the top and which dump from the bottom, and the buckets are handled by a crane. The calcined material is taken from the cupolas by the conveyor belt to overhead bins, from which it is loaded into cars for use as needed at the open-hearth furnaces.

Semi-Finished Steel Mill

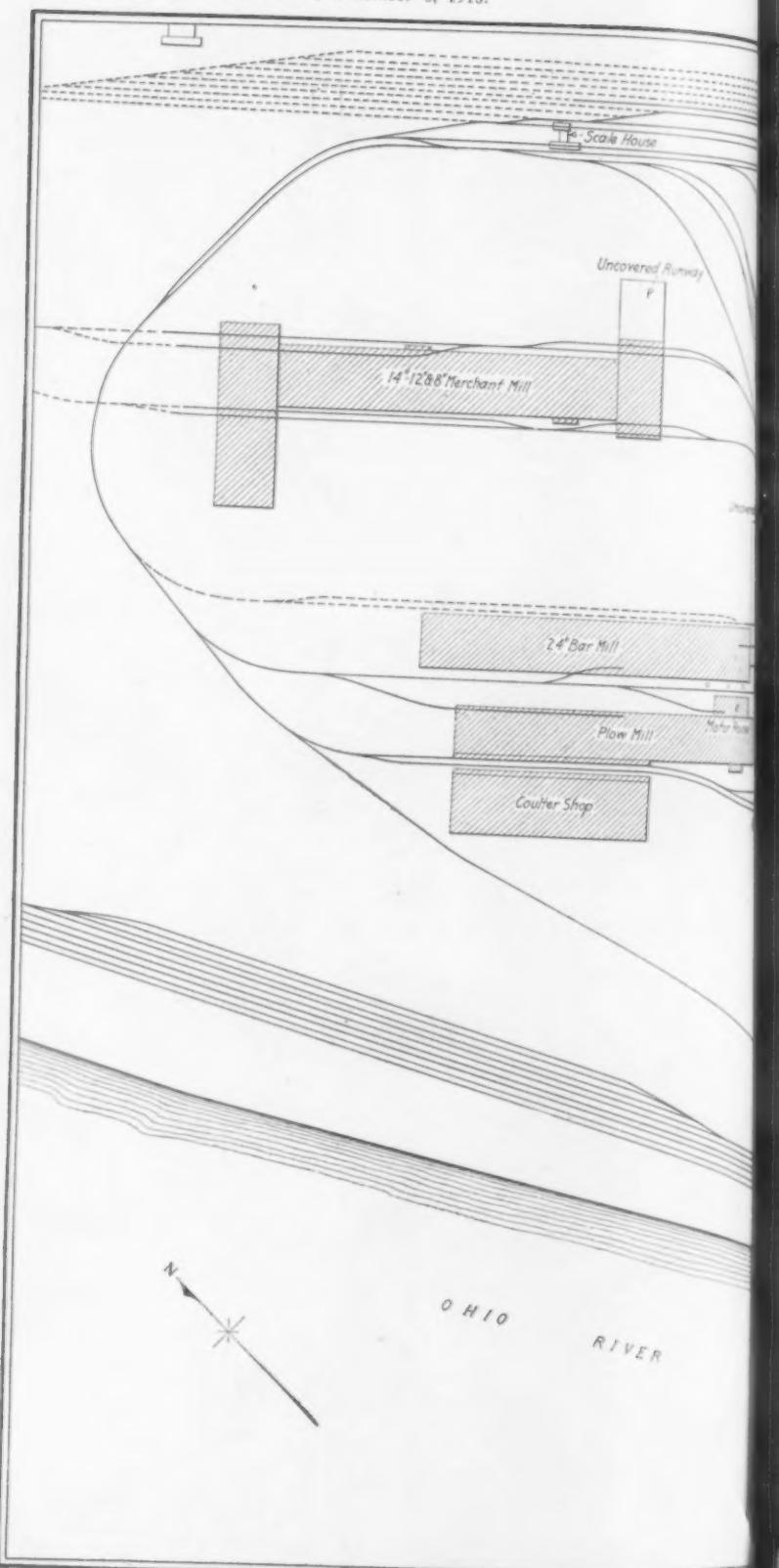
The pit furnace building is 356 ft. in length from center to center of columns, 84 ft. wide and 57 ft. high. It has a lean-to 34 ft. in width extending the entire length of the main building. It contains five 4-hole pit furnaces with a capacity of 8 ingots to a hole. The ingots are stripped by a 150-ton Morgan single-screw electric stripper with a span of 76 ft., located in the soaking pit building. The ingots are charged into and drawn from the pit furnaces by two 10-ton Morgan plunger-type pit cranes, also 76-ft. span. The repairs for the 150-ton stripper crane and the two pit cranes are taken care of by a 7½-ton monorail crane. A feature of all crane runways in the plant is that they are provided with safety walks on both sides with a railing between the walk and the crane itself, thus permitting repairs to be made without danger to the workmen.

The five pit furnaces are fed by producer gas from



Front and Side Views of the 500-Ton Mixer

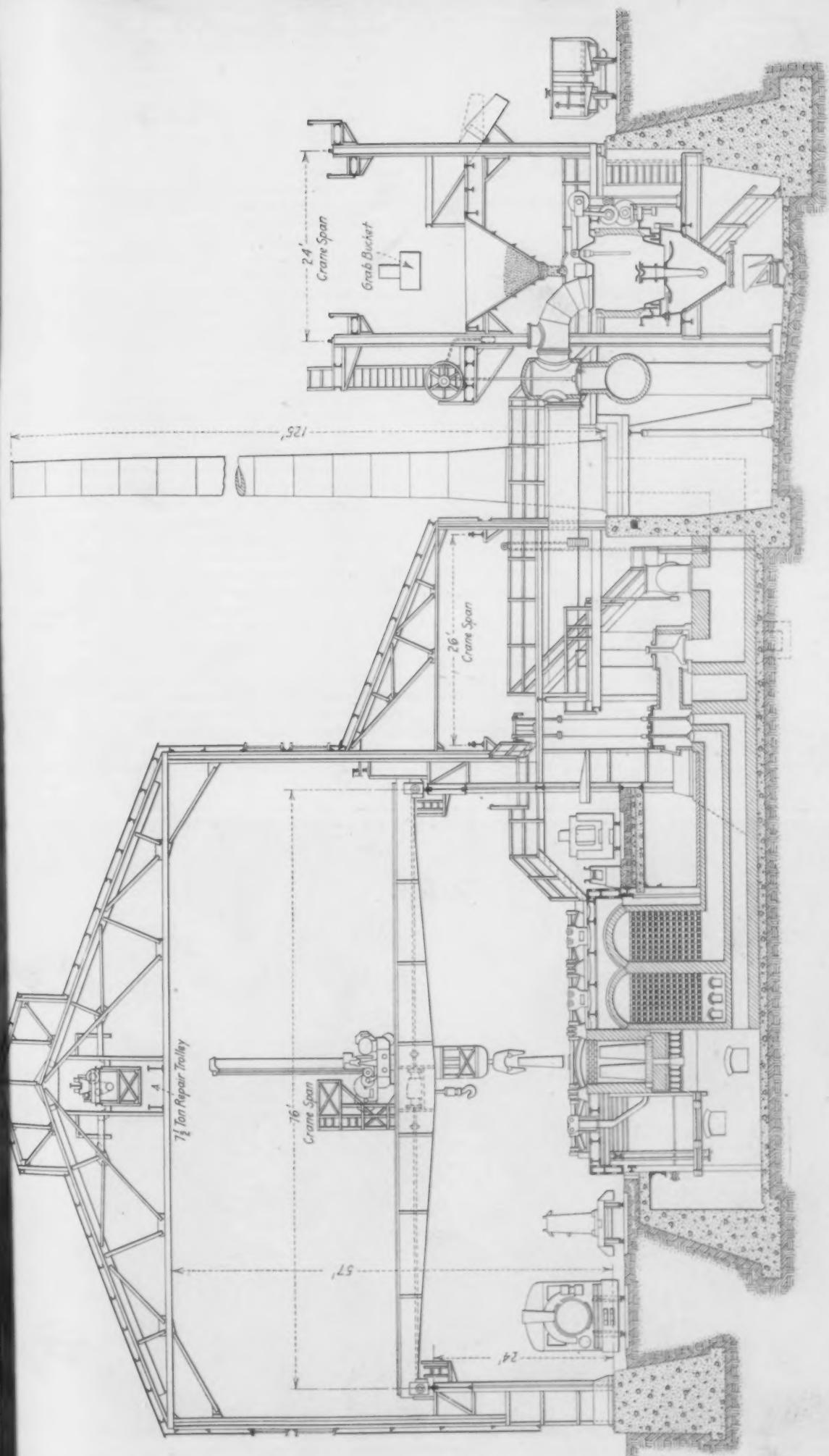
Supplement to THE IRON AGE, November 6, 1913.



Map of the Works

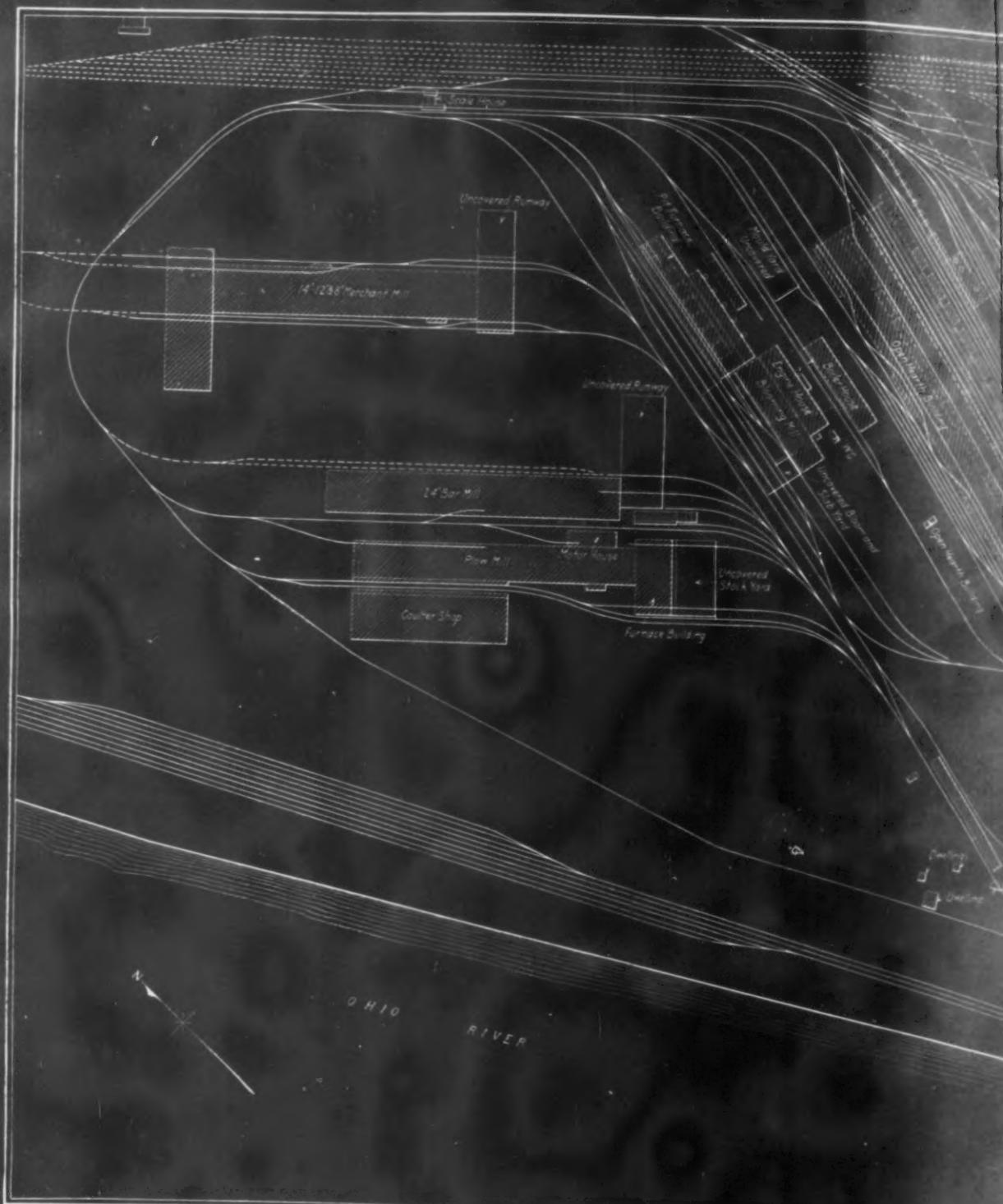






Cross Section Showing the Producer Plant and Regenerators for the Pit Furnaces for the Ingot

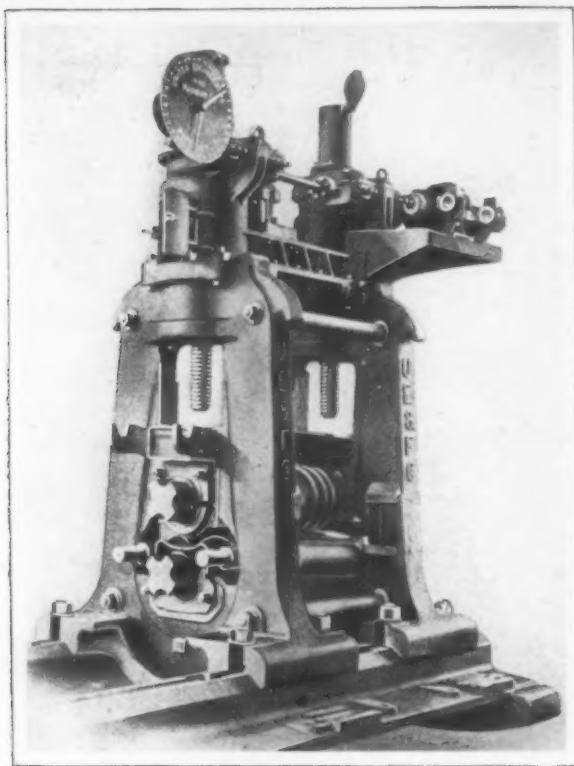
Supplement to THE IRON AGE, November 6, 1913.



Map of the Works of the Pittsburgh Crucible Steel Company



Company, Midland, Pa., Showing Present and Projected Buildings



Blooming Mill Having A-Frame Housings, from View Taken in Works of the Builder

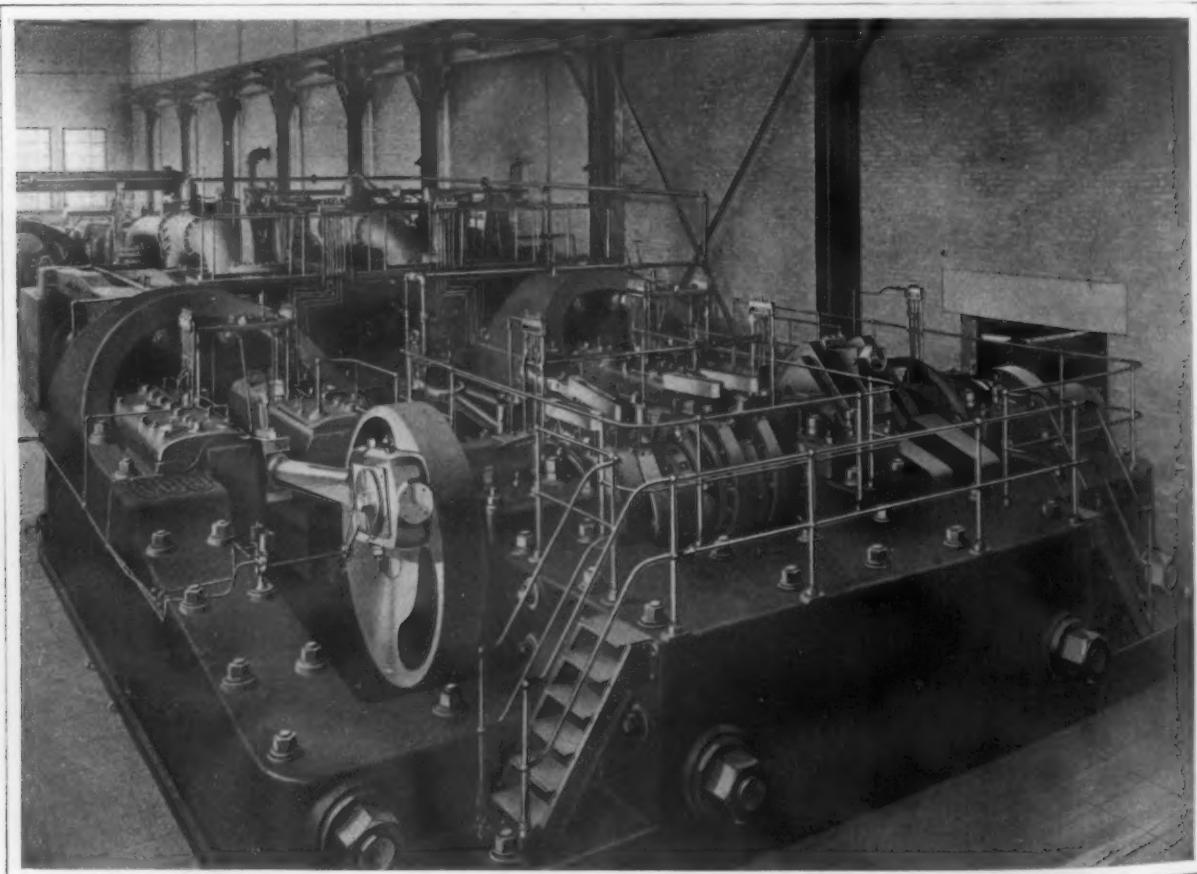
five 10-ft. Hughes mechanically poked producers. The producers are fed with coal from overhead bins, which in turn are supplied by an electric crane and a Link Belt bucket elevator, the elevator taking coal from a dump which is kept filled from a railroad car. The gas mains here were also furnished by R. Munroe & Sons Company.

The blooming mill is of the two-high type with rolls 40 in. between centers and was built by the United Engi-

neering & Foundry Company, Pittsburgh. It is of the same general design as the blooming mills built by this company for the Republic Iron & Steel Company at Youngstown, Ohio, and the American Rolling Mill Company at Middletown, Ohio. The roll housings are steel castings and embody features that were originated by the builder. The window of the housings, instead of having parallel sides, is spread out in the form of an A frame and the bottom roll is supported in the semi-circular filler block, which rests in a broad recess in the window of the housing. This construction allows the neck of the feed roller to extend through the window, and to be supported on the table girders which pass along outside the housings. The use of this filler block is to secure gradually varying sections of the housing posts, so that the housing is virtually a large steel link with no abrupt changes in section. This is considered of advantage in preventing breakage or cracks due to the working of the mill, as these defects commonly appear at a point where the metal varies greatly in area. The bottom roll carrier is held in in such a manner that it may be removed from the outside by loosening two bolts. The top roll carrier is fastened so that the top roll can be removed without loosening any bolts, and at the same time the fact that here are no bolts used make it impossible for the top rolls to become loose while the mill is in operation. The window of the housing is wide enough to remove the top roll endwise, and the bottom roll may be removed without disturbing any of the filings, and the front table rollers may be removed without disturbing either the bottom or top roll filings.

The screw down is electrically operated by a 100-hp General Electric motor with suitable shoe brakes, geared with one reduction to a worm shaft which engages worm wheels on the two housing screws, the worms and screws being right and left hand to equalize the end thrust. The worms run in an oil bath, and have been found to work very satisfactorily on a number of mills built by the same company. The top roll counterbalance is of the overhead cylinder type, the cylinder being placed on the top separators between the housings, and connected by two rods to the balance wheel which carry the top roll, and the end of the spindle carrier bar.

The pinion housings are of the entirely closed type, so



The 20,000 Hp. Twin Tandem Compound Reversing Blooming-Mill Engine Built by Mackintosh, Hemphill & Co., Pittsburgh

that the pinions run in an oil bath. The pinions have cut teeth, which, together with the kind of lubrication, are found very quiet and economical in running.

The mill is contained in a building 311 ft. 6 in. from center to center of end columns, 72 ft. in width and 40 ft. in height. There is a leanto connected to this building, which contains the engine room. It is 245 ft. in length, 32 ft. from center to center of the crane rail, 56 ft. to the center of the building columns and 33 ft. high. The ingots are taken from the pit furnaces and deposited on ingot cars designed by the company, which dumps them on the receiving table operated under Cutler-Hammer automatic control, and comprising four rollers driven by a 20-hp General Electric motor. From the receiving table, they are taken over 16 rollers, driven by a 75-hp motor to the approach table. The back mill table comprises 19 rollers driven by two 100-hp motors. From the mill the ingots pass to a table of 19 rollers driven by two 100-hp motors, and thence to the run-out table of 16 rollers driven by a 75-hp motor. They then pass an intermediate table of 16 rollers, driven by a 50-hp motor and then to the approach table to the shear, consisting of 16 rollers driven by a 50-hp motor. From the last named they pass to a 20 x 20-in. steam hydraulic down cut shear.

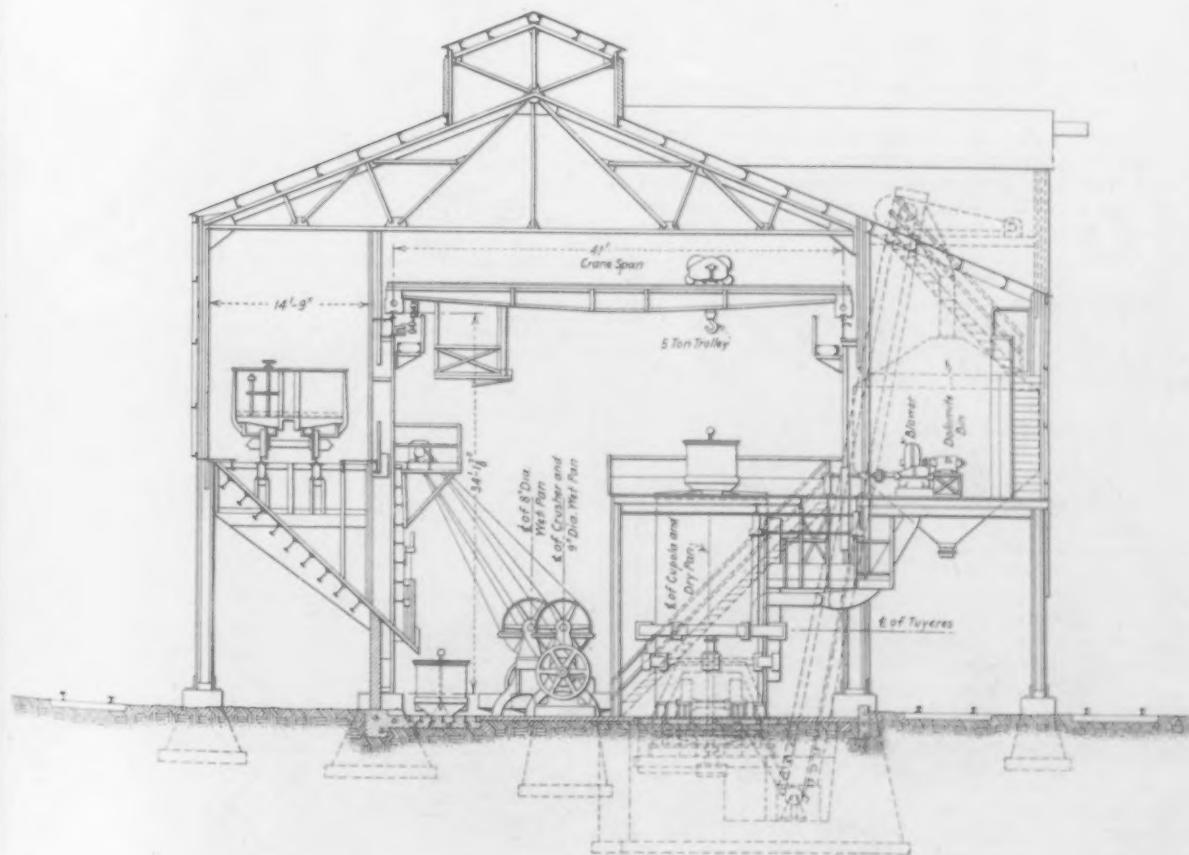
The bloom shear was built by the United Engineering & Foundry Company and operates on the same principle as the standard high-speed forging press built by this concern under the Davy patents. All operations are governed by a single lever, and precautions have been taken to insure the rapid action. The maximum opening between the shear knives is 24 in., but a single stroke with the intensifier moves the knives through 12 in., so that when cutting blooms thicker than 12 in. it is necessary to make two strokes. The valve gear is designed so that this may be done with exceedingly small loss of time and without making any adjustment of valves or the operation of any levers, other than the ordinary handling lever. This type of shear is employed also because of its advantage in stalling in the case of a cold bloom, or when one of excessive size is placed between the knives, and a like advantage it is felt obtains in case the shear heads are brought together and the full pressure on the intensifier is applied.

After being sheared the billets drop to a tilting table, containing 16 rollers, driven by 30-hp motor, the table

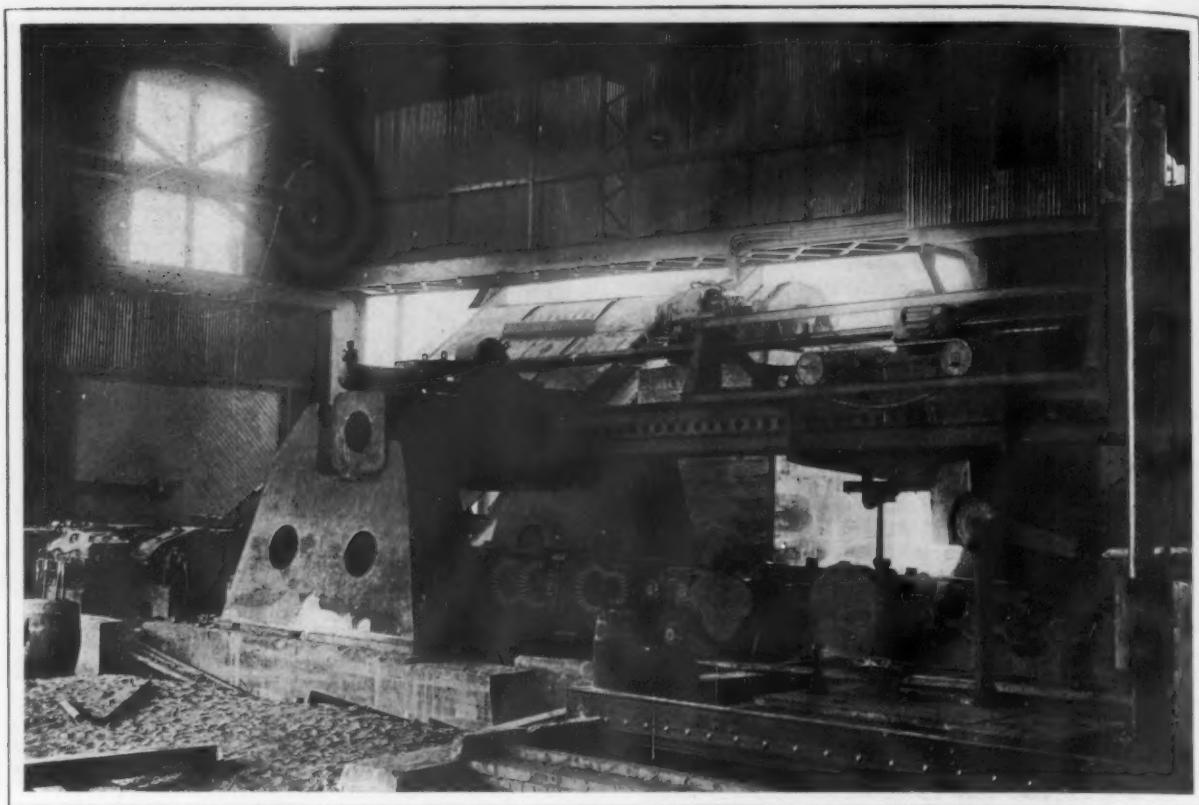


Gas Producers in Process of Erection, Housed in Groups of Four for Each Pair of Furnaces

being raised and lowered by hydraulic cylinders, and is also moved back and forth by hydraulic cylinders, so as to allow the crop ends to fall directly from the shear to a crop end conveyor driven by a 30-hp motor. At the end of the tilting table is a push-off table operated by a 30-hp motor, from the end of which the steel is pushed to a billet conveyor which loads the steel into cars. This conveyor is driven by a 50-hp motor. The blooming mill is equipped with a 50-ton Morgan electric crane having a 5-ton auxiliary. The slab yard runway is 311 ft. long,



Cross Section of Calcining Building for Manufacturing Cementitious Material for the Open Hearth Furnaces



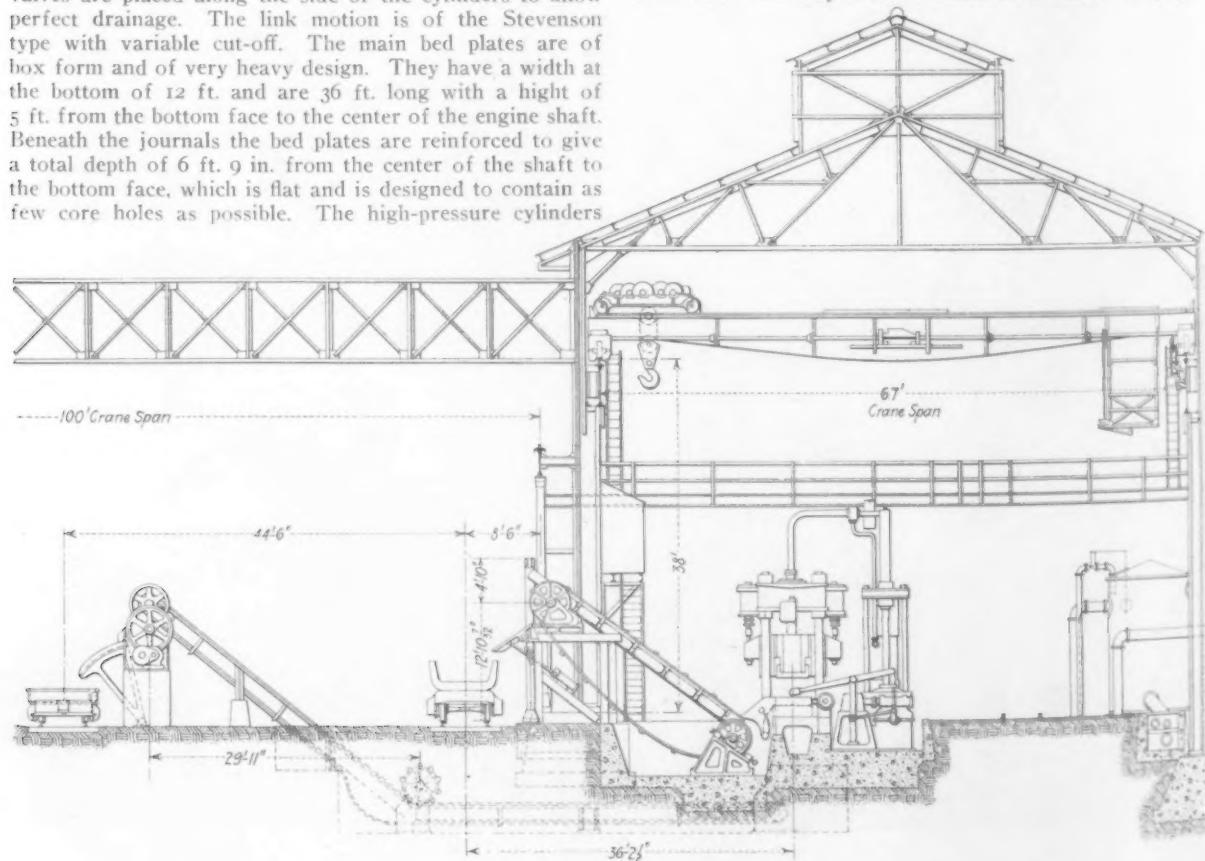
Tilting Table Beyond Billet Shear and Loading Conveyor in Background

100 ft. wide and is equipped with one 10-ton Alliance crane.

The blooming mill engine is of the twin tandem-compound direct-connected reversing type, operating condensing through a 96-in. Mesta Helander barometric condenser carrying 24 in. vacuum with a Mesta air pump and a 14-in. motor-driven De Laval centrifugal circulating pump. The engine has 44-in. high-pressure and 70-in. low-pressure cylinders and a stroke of 60-in. and is designed to run at 100 to 150 r.p.m. and to develop 20,000 hp. The piston valves are placed along the side of the cylinders to allow perfect drainage. The link motion is of the Stevenson type with variable cut-off. The main bed plates are of box form and of very heavy design. They have a width at the bottom of 12 ft. and are 36 ft. long with a height of 5 ft. from the bottom face to the center of the engine shaft. Beneath the journals the bed plates are reinforced to give a total depth of 6 ft. 9 in. from the center of the shaft to the bottom face, which is flat and is designed to contain as few core holes as possible. The high-pressure cylinders

are secured to the extension bed plate by keys and are supported directly by feet cast on the cylinder, which rest on the extension bed plates, the keys being placed in the middle of the feet to allow for expansion.

The four cylinders are made of close-grained air furnace iron, and the piston valves have removable seats. The crank shaft is a solid steel forging machined all over. A 6-in. hole extends along the axis for the entire length of the shaft, and three journals are provided, two being 44 in. long by 29 in. diameter, and the other 48 in. long by 29 in. diameter. The body of the shaft has a diameter of 29 $\frac{1}{4}$ in.



Cross Section Showing the Billet Loading Conveyor and the Crop End Conveyor

The wrist of the crank shaft is 27 in. in diameter and 17 in. long, while the wrist on the crank disk is 19 in. in diameter and 14 in. long. In the valve gear, there are two rock shafts all told, and six pins suffice for the entire transmission from eccentrics to the piston valve of the engine. The total weight of the engine is about 1,500,000 lb.

The hydraulic pressure throughout the plant is furnished by two Snow cross-compound high-pressure pumping engines, 24 and 40 x 7½ x 36 in. These engines each deliver 1000 gal. per minute at 600 lb. pressure. The engines work directly on an accumulator, and are governed by both fly-ball governors and Jarecki throttling governors. The hydraulic system water is softened and filtered, and it is a return water system throughout.

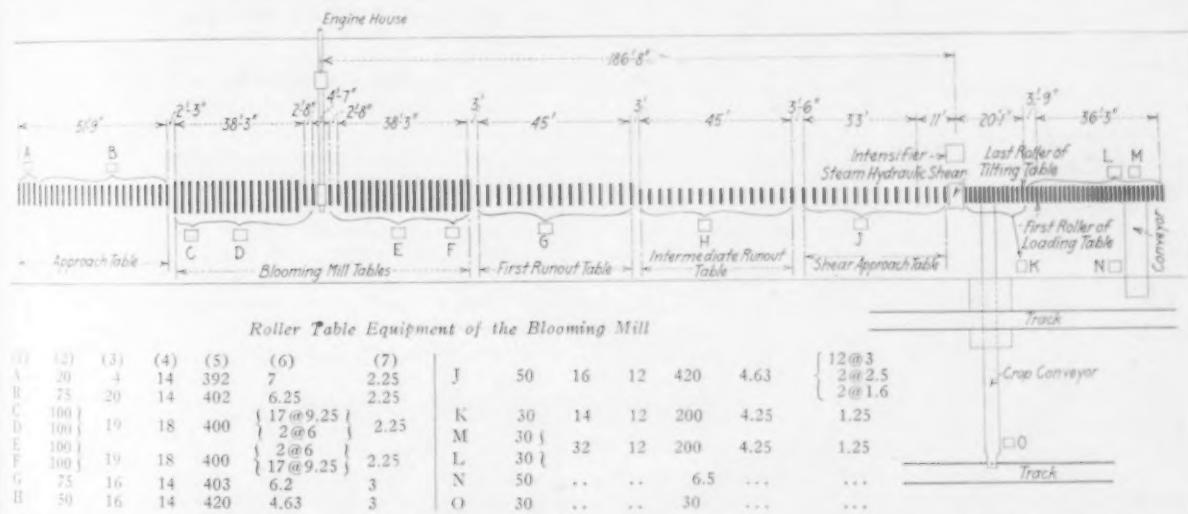
The feed-water heater is an 8000-hp Cochrane heater furnished by Dravo-Doyle Company, Pittsburgh, and it is supplied with exhaust steam from the pumps, traps, etc. located in this building. The boiler feed is supplied by two 16 x 10 x 24-in. Epping-Carpenter duplex reciprocating pumps. The engine room is spanned by a 50-ton Morgan crane.

The blooming mill boiler house is 261 ft. long, 51 ft. wide and 44 ft. high, and is equipped with 10 604-hp. Stirling boilers with Babcock & Wilcox superheaters, operated at 175 lb. pressure and 100 deg. superheat. Green automatic chain-grate stokers are used, and there is a coal and ash-handling system installed by the Link Belt Engineering Company, comprising buckets operated by an endless chain which elevates the coal to the hoppers above the boilers, where it is distributed by a flight conveyor. The ashes are collected in ash hoppers, dumped in an electric larry running in a tunnel beneath the boilers, carried by the

to the furnace bins, which are of the suspended bunker type. There are five bins of 800 tons capacity each, and from these the ore is taken by electrically operated laries to the skip hoist. The skip hoist is an Otis of the standard type, equipped with two skip cars of 135 cu. ft. capacity.

The furnace has a rated daily capacity of 500 tons and has been operated continuously on one lining since 1906, having made up to the present time about 1,260,000 tons of basic iron. The fire brick in the furnace lining was furnished by the Harbison-Walker Refractories Company, Pittsburgh. The molten metal is drawn off into ladles of 30 tons capacity each, and these ladles are then taken either to the Heyl & Patterson pig-casting machines, or to the 500-ton Mesta mixer in the open-hearth department. The slag is taken by runners to a pit in the cast house and granulated, and is then dumped by a Morgan bucket crane of 10 tons capacity into standard hopper cars on tracks outside of the cast house. The slag is dumped wherever needed for filling purposes around the plant.

The blowing engine house is equipped with two horizontal disconnected compound blowing engines made by the Southwark Foundry & Machine Company. They can be operated either as compound engines or as four single engines. The dimensions of cylinders are 44 in. and 84 in. with a 60-in. stroke and 84-in. air tubs. The engines when compounded deliver 690 cu. ft. of free air per revolution, or about 41,400 cu. ft. of free air per minute, at a pressure of 15 to 21 lb. per square inch, the engines running normally at 60 r.p.m. There is also an Ingersoll-Rand air compressor with a capacity of 1000 cu. ft. of air per minute. This air is used in the shops in the blooming mill for chipping billets, for construction work and for



EXPLANATION: Columns 1 and 2 give the designation and power of the motors; column 3 gives the number of rolls; column 4, their diameter; column 6, their length in feet; column 7, the spacing of the rolls in feet, center to center; column 5, the speed of the roller table or of the conveyors, as the case may be, in feet per minute.

larry to a Link Belt automatic skip hoist bucket and delivered to overhead bins, for loading cars at convenience.

All of the steam lines for the different power plants was furnished by the Best Mfg. Company, while all the hydraulic piping was done by the company itself. The steam lines, exhaust lines and boiler-feed lines are covered with Johns-Manville asbestos-sponge felt, double thickness for the high-pressure steam lines, while the exhaust and feed lines have 1-in. asbestocel covering.

The Blast Furnace

The blast furnace at Midland was originally built by the Fownes interests in 1906 and is 85 ft. high by 14 ft. 6 in. diameter of hearth and 21 ft. 6 in. in diameter of bosh, and is equipped with five McClure hot-blast stoves, 21 ft. 4 in. in diameter by 100 ft. high. The fifth stove to be used as a spare was recently added.

The ore is delivered into large concrete pits from cars placed on switches running from the Cleveland & Pittsburgh tracks. A Hoover & Mason ore bridge of 15 tons capacity, capable of handling about 2500 tons every 12 hr., is employed and this bridge also handles the coal for the plant. Later the ore is picked up by this bridge and taken

barometric condenser with the Mesta air pump and a 16-in. De Laval motor-driven centrifugal circulating pump.

The blast-furnace boiler house is equipped with 10 350-hp Rust water-tube boilers, operated at 175 lb. pressure and 100 deg. superheat, from Foster superheaters, and four 602-hp Rust boilers equipped with Babcock & Wilcox superheaters. These boilers are fed by two 12 and 18 x 10 x 16-in. duplex reciprocating pumps and one 8-in. Epping-Carpenter Kerr turbine-driven centrifugal boiler-feed pump with a capacity of 500 gal. per minute. The two 4000-hp feed-water heaters are of the Cochrane type, in which 210 deg. is constantly maintained, the exhaust steam for heating this feed water being supplied by the different pumps throughout this end of the plant. The one 8-in. centrifugal pump will supply this boiler house with feed water, the two reciprocating pumps being held as spares.

The electric power throughout the plant is generated by one 5000 k.v.a. General Electric high-pressure steam turbine, one 3125-k.v.a. high-pressure steam turbine, and three 400-kw steam engines. Steam for these units is generated in the blast-furnace boiler house, being brought to the power house in a 16-in. header and distributed through 10-in. and 8-in. branches to the turbines.

These turbines carry $28\frac{1}{2}$ -in. vacuum, the 5000-k.v.a. turbine condensing through a 108-in. Mesta condenser, and the other turbine through a 92-in. Mesta condenser. One Mesta 14 and 36 x 36-in. air pump takes care of both condensers. The circulating water is supplied by an 18-in. and 16-in. motor-driven De Laval centrifugal pump respectively. The turbine-driven generators supply three-phase, 25-cycle, 6600-volt alternating current.

In the electric power house is substation No. 1, which includes two 500-kw. General Electric motor-generator sets, converting the alternating current to 250-volt direct current. A second substation is to be located in the plow mill building, with two 500-kw. motor-generator sets.

An Unusual Water Distribution System

The water system in use at the plant is unusually interesting. Owing to the high head to be pumped against, the water is used several times over in order to reduce pumping costs. The supply is obtained from the Ohio river, which is slightly alkaline and at times slightly acid. The pump house, situated on the river bank, is equipped with two 15 x 17-in. Epping-Carpenter triplex pumps driven by 220-volt motors, and two 20-in. R. D. Wood Company centrifugal pumps having a capacity each of 15,000,000 gal. per day and driven by 550-hp, three-phase, 25-cycle, 6600-volt motors on a vertical shaft. Provision has been made for a future installation of two more 20-in. centrifugal pumps.

The delivery is through one 48-in. and one 24-in. pipe line. The 24-in. line runs direct to the reservoir situated on the yard level. This line is used only as an auxiliary. Under ordinary running conditions water is pumped through the 48-in. line to the electric power house condensers. A 24-in. outlet is connected through a float valve to the reservoir. Water leaves the power house condensers, where a vacuum of $28\frac{1}{2}$ in. of mercury is obtained, at a temperature of 90 deg. F. It is used again to supply the blooming mill, merchant mill and blast furnace blowing engines condensers. The blooming mill engine condenser maintains a vacuum of 24 in., the merchant mill and blowing engine condensers a vacuum of 26 in. each. The discharge water from the blowing engine condenser is taken to a water-softening and filtering plant of what is known as the Wefugo system, constructed by the Wm. B. Scaife & Sons Company, Pittsburgh. This water leaves the condenser at a temperature of 120 deg., which aids the reactions of the softening reagents. The softening plant has a capacity of 60,000 gal. per hour. It consists of two reaction tanks having a capacity of 165,000 gal. each and two sand filters. A third reaction tank and sand filter is supplied with raw water from the 48-in. line and is used to filter and purify the water used by the town of Midland.

The reservoir mentioned above is used as a raw water storage and has a capacity sufficient to supply the plant for 3 hr. Water from the reservoir is pumped into a standpipe from which it is distributed throughout the plant. There is also a second standpipe used for softened water. The pumping station at the reservoir is equipped with two Epping-Carpenter centrifugal pumps driven by Kerr turbines having a capacity of 8,000,000 gal. each per day and two Epping-Carpenter 12 and 22 x 17 x 24-in. duplex pumps. These four pumps are used to pump from the reservoir into the standpipe, the duplex pumps

serving as a reserve. There are also two 18 and 16 x 24-in. Wilson-Snyder pumps used to supply the town of Midland, and several motor-driven centrifugal pumps for the water softener.

All the water used throughout the plant is measured by venturimeters of the register-indicator-recorder type manufactured by the Builders' Iron Foundry Company. The largest of these is a 48-in. meter in the main supply line from the river. They are used on the various distributing lines and the condenser water for the power house is likewise measured, as is also the feed water for the boiler houses.

The supply of coal for the entire works is obtained from the mines of the Crucible Coal Company, an identified interest, which has large producing mines in the Brownsville, Pa., district; and the coal is brought down the Monongahela river and unloaded into an electric coal hoist and is taken to various parts of the plant by electric larries on the alternating line.

The company owns a total of about 900 acres of land at Midland, of which 447 acres are devoted to the works and future extensions, while 445 acres, located just east of the works, will be given over to the new town of Midland. Already a large number of houses have been erected and are occupied by the employees. With the eight open-hearth furnaces in operation, the plant will have a total monthly capacity of about 35,000 tons of steel bars, and most of this steel will be used in its finishing mills at Midland and in the Pittsburgh district, while part of it will be sold in the open market.

The officials of the Pittsburgh Crucible Steel Company are: Herbert DuPuy, chairman of the executive committee; J. W. Dougherty, president; C. C. Ramsey, vice-president; C. W. Rowlands, secretary; George A. Turville, treasurer.

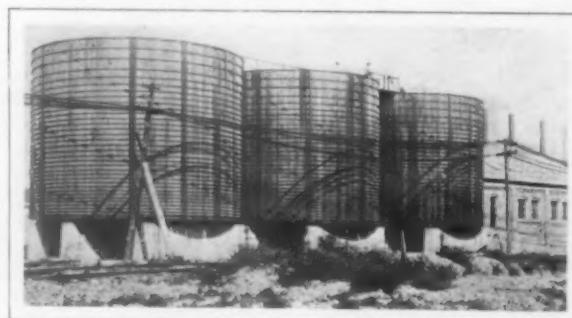
New Construction Under Way

At the present time the Pittsburgh Crucible Steel Company has under way considerable new construction at Midland, which will greatly increase its capacity in the manufacture of finished steel and will give it a wider line of products. The new work under way include a Morgan continuous merchant mill, the roughing stand to be 14 in. and the finishing stands 12 in. to 8 in. These mills will roll $3\frac{1}{2}$ to 2-in. rounds and various squares and merchant flats. This mill will be contained in a building 120 x 900 ft. The company is also building a 24-in. reversing bar mill to be contained in a building 108 x 755 ft., the product of this mill to be from 2-in. to 8-in. rounds. The Crucible Steel Company of America has always been a large manufacturer of railroad springs, and on this new mill it will also roll steel car axles.

Other new construction includes a 26-in. motor-driven plow mill to be contained in a building 79 x 820 ft., a coulter shop 118 x 400 ft., a foundry 131.5 x 240 ft., a machine shop 144 x 240 ft., a carpenter and pattern

storage shop 48.5 x 165 ft., a storeroom and oil storage house 55 x 140 ft., combined laboratories 70 x 93 ft., and a sanitary building, brick sheds, etc. The steel work in all these buildings is being furnished and erected by the American Bridge Company of Pittsburgh, and the roofs will be of American cement tile.

Space limitations have left the special safety provisions for later description.



Water Softening Plant for the Midland Works

The contracts in connection with the construction of the new Michigan Central Terminal at Detroit, Mich., include 200,000 sq. ft. of the same roofing, involving five carloads of material to be used for railroad sheds alone. If placed end to end, these sheds would extend over a mile. The Johns-Manville Company will also furnish the waterproofing, smoke stack lining, 2000 ft. of sectional conduit, and 16,000 lin. ft. of pipe covering for plumbing, heating and power lines throughout the building.

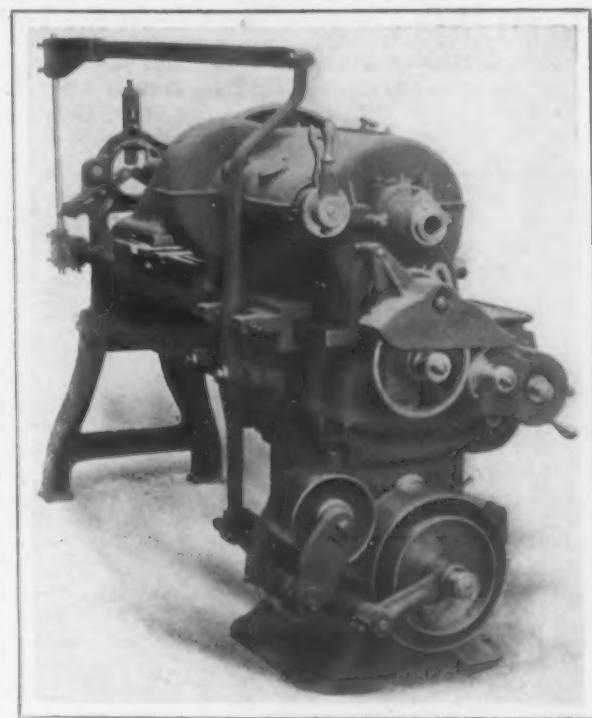
The proposition of bridging the Delaware River between Philadelphia and Camden, N. J., is again having some consideration. Reports have it that the plans of those interested have reached the point where an engineer has been commissioned to make tentative drawings and that the Pennsylvania Railroad is interested. This project is being developed, it is said, along with the plans for the proposed Belt Line Railroad along the Delaware River front.

A Geared Head Single Pulley Lathe

A new type of geared head lathe with a single pulley drive has been placed on the market by the Bradford Machine Tool Company, Cincinnati, Ohio. This tool, which is of the heavy quick change gear pattern, is built with swings ranging from 14 to 42 in., the 18-in. size being the one shown. A number of features of the builder's standard type of lathe are embodied in the construction, which to some extent follows that of a motor-driven tool that was illustrated in *The Iron Age*, March 21, 1912.

The lathe is of the single pulley type and transmits its power through a geared head, the special feature being the use of an idler pulley arrangement, which it is emphasized avoids any interference with the mechanism on the end of the tool. A single fixed pulley on the line-shaft can be employed where that is located in the proper relation to the lathe, but the regular equipment is a double friction countershaft of the customary type with both belts driving forward. If it is desired to have one belt for reversing, this can be taken care of, and with a triple friction countershaft it is possible to obtain 16 forward and 8 reversing speeds. The lathe driving belt tracks around the idler pulleys, which are arranged as shown in the end view, and avoids interference with the mechanism on the end of the lathe. It is possible to adjust the frame supporting these idler pulleys in a downward direction, so that an endless belt can be employed and give it the proper tension. A shifter pole, running the full length of the lathe, operates the shifter mechanism mounted on the back of the tool and provides a convenient and ready means for engaging or releasing the lower clutch initial driving pulley when the speed is being changed. When it is desired to stop or start the lathe, inspect or remove work, the lever on the headstock is employed.

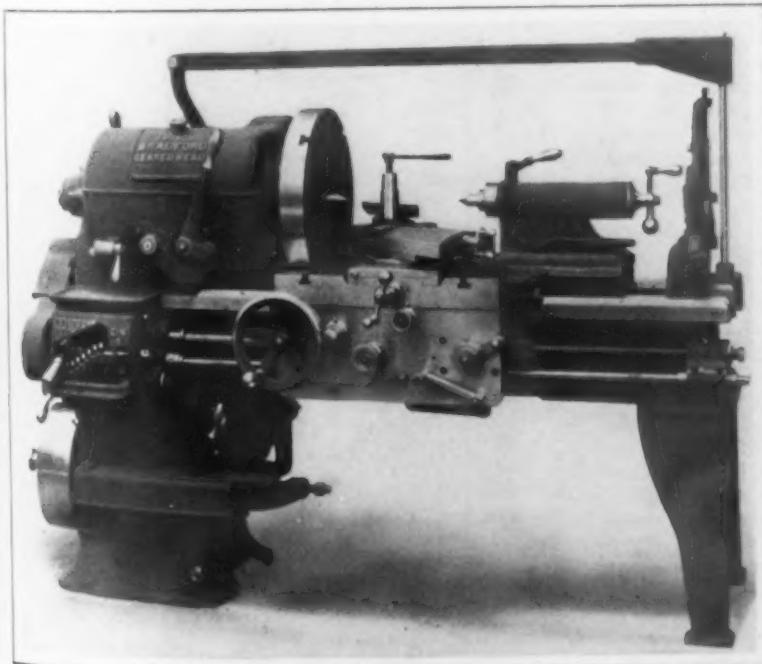
A selective type of automobile speed box consisting of two shafts and eight gears, all of which are substantially incased and arranged to replace the usual supporting leg at the headstock end of the leg, is employed to control the power. These gears are arranged in sets of four on each shaft, those on the lower one being paired so that each pair slides independently of the other, the motion being controlled by a single lever. There are two shifting forks which engage each set of the paired sliding gears and the shifter lever independently. The four positions of the speed box lever provide four of the changes and these are



A Partial End and Rear View Showing the Arrangement of the Driving Pulley and Idler

wheel on the right end of the upper gear box shaft and a friction clutch operated gear on the main spindle. This gear meshes with another on the back gear shaft which carries a second gear that drives the lathe spindle through a second positive clutch-operated gear on the spindle.

A thread indicator of the builder's standard type is provided, together with a quick change gear device with a wide range of feeds. It is possible to cut all the standard and pipe threads, including an 11½ pipe thread, without removing any of the gears. Only one lever is required and the drive from the spindle to the lead screw is direct. The feeds are 4½ times the threads. For cutting any odd threads, change gears of the ordinary type can be used directly between the spindle and the lead screw and an automatic stop for longitudinal feeds is regularly provided. Emphasis is laid upon the fact that the lead screw is not splined, but is cut from a master screw, a feed rod being furnished for feed purposes and thus saving the lead screw and nut. The lathe has a friction cross feed, graduated to read in thousandths of an inch, as well as a friction traverse feed in the apron and an automatic stop for the carriage. If desired, the lead screw and change gears can be furnished to conform to the metric standard.



A Recently Developed 18-In. x 6-Ft. Heavy Pattern Geared Head Single Pulley Quick-Change Gear Lathe

doubled by shifting the lever on the headstock to either the right or the left. The first driver in the head is a short shaft carrying a Morse chain wheel and a gear wheel, which are in driving connection respectively with a chain

The Illinois Steel Company has posted notices at its works, dated November 1, to the effect that no employee is now to work more than six days a week. Wherever it is necessary, substitute crews will be put on where the regular men have heretofore been doing extra turns or overtime. One of the collateral benefits of this new plan, at a time when the work of the mills is easing up, will be to distribute the work among all of the employees, keeping employed a much larger number than would otherwise be possible.

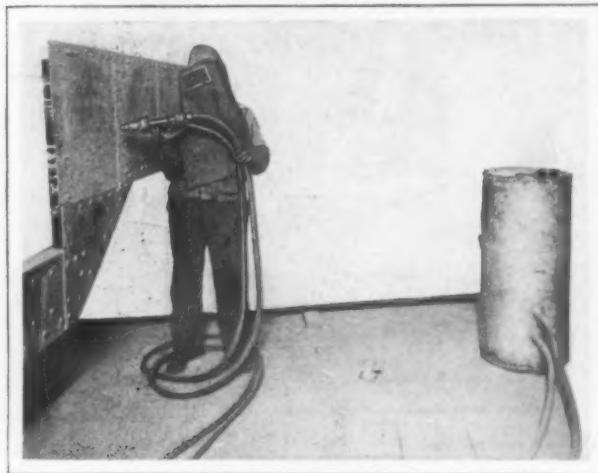
The J. Faessler Mfg. Company, manufacturer of boiler making tools, announces the removal of its general sales office to rooms 1934-6 Railway Exchange Building, St. Louis, Mo. Charles F. Palmer remains in charge.

Evans High-Pressure Sand Blast System*

Data on a Double Hose Outfit for
Cleaning Castings and General Work

BY DAVID SANDS FERRIS†

Sand blast machines have been in more or less successful use for many years, the first device of the kind having been patented in or about the year 1870. This was followed by several others, all of which have been utilized chiefly for cleaning stone buildings, soft iron and



The Evans Portable High-Pressure Sand Blast Machine in Operation

brass castings. These machines are all of the single hose type; they have been tried in removing old paint and rust from metal structures, and as found by experts in operating at a low pressure it took a long time and did not remove the rust or paint completely, leaving it on in spots. As soon as sand blast machines had been in use for a few years the United States Navy Yard in Brooklyn, in 1897 cleaned, or attempted to do so, the man-of-war Brooklyn. The work was not satisfactory to the Government and I believe has never been tried since then on U. S. Government ships. It has, however, been in use to a certain extent in foundries of the navy yards. It remained for the Evans high-pressure sand blast machine to be the first machine which ever successfully cleaned steamships, which was done at the Cramp shipyard in May, 1912.

Bridge engineers became deeply interested in the question of sand blasting structural steel, because the mill scale, which is on all structural steel, must be removed before the first, or shop, coat of paint is applied, otherwise corrosion is bound to take place and the I-beams will become gradually eaten up by rust. This rust operates on steel exactly as a cancer on a human body and undoubtedly many railroad wrecks, which have occurred on bridges even when incased in cement, have been directly from the effect of the corrosion of the steel beams. We have proved beyond the peradventure of a doubt that wherever mill scale is not removed even under paint, when exposed to weather or dampness, and even when incased in cement that a chemical action does take place, and the structure is thereby enormously weakened. While this may not be of great interest to you gentlemen of the foundry trade, still it shows the necessity of using a sand blast on steel or iron whether it be structural material or castings which enter into the general manufacturing business and uses for the general trade.

Right here a further word in regard to the composition of mill scale, or at least of its characteristic porous inner layer, which makes it possible for corrosion to attack the steel and loosen the scale forming centers from which rust will extend. Mill scale forms in two layers, the inner one being represented by the formula $6\text{Fe} + \text{Fe}_2\text{O}_3$ and is very porous and brittle. The outer layer contains a larger but varying proportion of Fe_2O_3 . The

*An address, substantially in full, delivered before the Associated Foundry Foremen of Philadelphia, October 8.

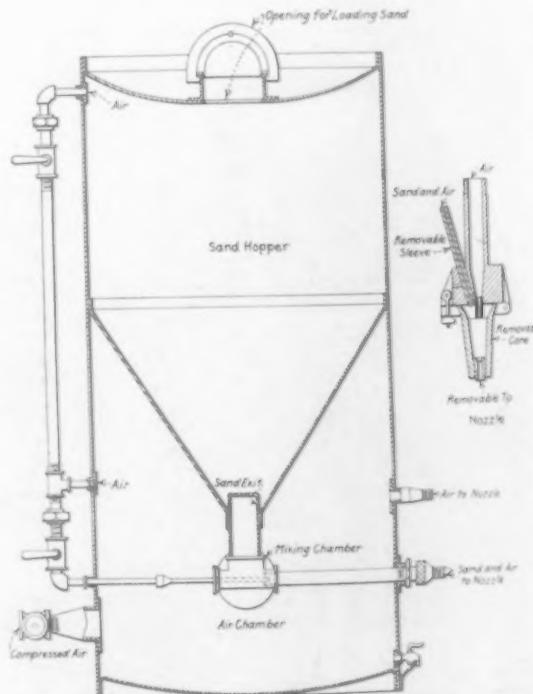
†Carter Metals Cleaning Company, Philadelphia, Pa.

air and moisture contained in this porous scale tends to destroy the paint spread over it by starting corrosion. This scale is magnetic. A galvanic action is said to be set up around the edges, and corrosion commences there and afterward extends under the scale and outward under the paint. It is very important, therefore, that the mill scale be removed by some efficient means before the first coat of paint is applied.

With this digression I shall return now to the Evans high-pressure sand blast machine as applied to foundry work on both iron and steel castings. The machine is operated under a high pressure of from 90 to 100 lb. and will maintain steadily this or any desired pressure. This is rendered practical as the Evans uses a double hose connected at the nozzle, where the sand and the compressed air unite, each being brought to that point independently of the other, so there is no loss of pressure from friction. The free air passes through a turbine high velocity jet $3/16$ in. in diameter. The turbine principle, as you are all well aware, has developed the very highest type of steam engines, and it is this principle as applied to air, which we have adopted in our machine. The compressed air being expanded in the nozzle through this turbine high velocity jet, projects the sand from the end of the nozzle with a velocity of from 1200 to 1500 ft. per min. The discharge in cubic feet of free air at the following pressures will show its great efficiency and the fact that it uses not more than one-quarter of the air of any other single hose machine:

Discharge of Air Through 3/16-In. Turbine Jet		
Air, cu. ft.	Pressure, lb.	Power required, hp.
60	80	11.8
76.5	90	15
83.8	100	17.3

This great saving in air means a corresponding saving in horsepower. Again, the pressure is constantly maintained owing to the fact that the air which passes through the turbine jet, which is $3/16$ in. in diameter, can never vary. This jet will never increase in size as it is recessed back in the nozzle where the sand is forced through the sand and air hose into the mixing chamber or removable cone in the nozzle. The sand is then forced out through the tip of the nozzle by the pressure of air through the turbine jet, acquiring there a centrifugal or spiral motion which causes the sand to whirl and this



Detail View Showing the Arrangement of the Various Parts and the Construction of the Nozzle

motion going out through the tip of the nozzle at a high velocity strikes the object which is to be sand blasted and not only by the direct play of the stream of sand, but by the whirling motion, it scours off any scale on the

castings caused by the flux or otherwise. This constant flow of air is of the very greatest importance not only from the standpoint of economy, but also from the standpoint of efficiency, as it will clean a given surface more rapidly than other machines, and will not use as much sand.

On the other hand, single hose machines will start with a nozzle opening of $\frac{3}{8}$ in. and will increase this opening, thereby increasing the flow of air and sand, which, of course, is caused by the fact of the sand and air passing out at the end of the nozzle. The sand wears out the nozzle very quickly and also the friction lessens the pressure and increases the horsepower required.

In conclusion there is no doubt that the numerous sand blast machines, which were originally designed for low-pressure machines, have been improved in every possible way to a high-pressure machine except at the one salient and important point, the nozzle, and the fact that they are and always will be single hose gives the double hose machine an enormous advantage. The principles which I have endeavored to explain to you I unquestionably say are basic principles, and as applied to-day by us, show such wonderful advantages over other machines, as will enable us unquestionably to build machines which are adaptable for every kind of use where sand blasting may be used.

The Indianapolis Automobile Industry

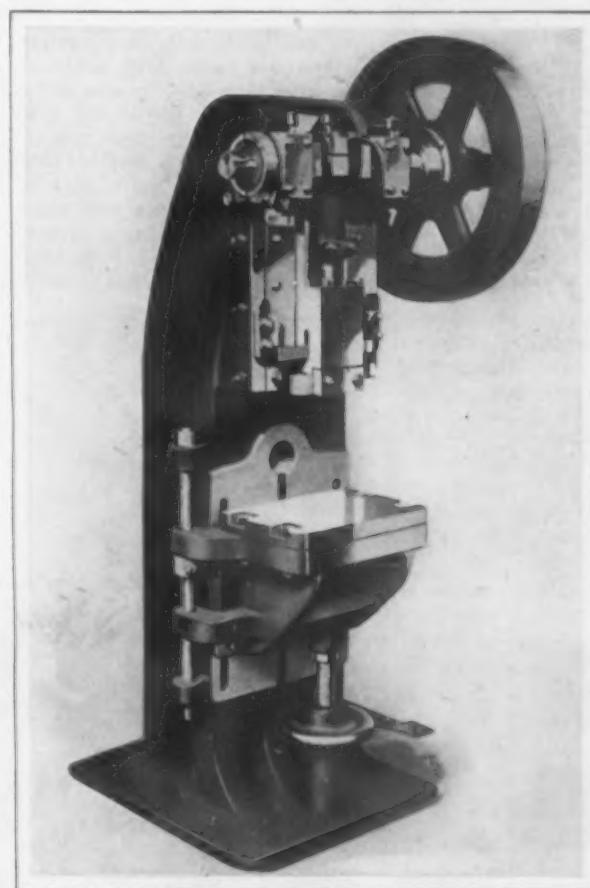
The Indianapolis Chamber of Commerce is preparing a series of articles dealing with the industries of the city. The first issued shows that the output of Indianapolis-made automobiles is 16,400 annually, of the value of \$11,000,000, and that about 14,000 men are employed in the automobile factories. It is now the chief industry of the city, which was a pioneer in the building of motor cars. The Waverly Company was established in 1897, National Motor Vehicle Company in 1900, Nordyke & Marmon Company started its automobile-making department in 1901, Premier Motor Mfg. Company was established in 1902, Marion Motor Car Company in 1903, American Motor Company in 1906, Cole Motor Car Company and Empire Automobile Company in 1909, Motor Car Mfg. Company in 1911, Stutz Motor Car Company in 1911, Mais Motor Truck Company in 1911, Henderson Motor Car Company in 1912 and Lyons-Atlas Company, manufacturer of engines and boilers, began to build automobiles the present year. The Overland car has been manufactured in Indianapolis but was moved to Toledo.

Among the companies that manufacture automobile accessories are the Presto-Lite Company, employing more than 500 men; G & J Tire Company, one of the largest in the country; Diamond Chain & Mfg. Company, and Wheeler & Schebler, manufacturers of carburetors, at the rate of 300,000 a year. Among the allied industries are the Stutz Auto Parts Company, Spacke Machine Company, Link-Belt Company, American High Speed Chain Company, Oakes Fan Company, R. J. Irvin Mfg. Company (tops and bodies), Waverly Company (wheels), Capitol Body Company, Schiedel-Thompson Mfg. Company (sheet metal), Hayes Mfg. Company (sheet metal), Christian Off & Co. (tanks and sheet metal), Duckwell Belting & Hose Company, Zenith Metal Company (metal bindings), Indianapolis Drop Forging Company, Martin Forging Company, Bates Forge Company, W. K. Milholand Machine Company, Pumpelly Battery Company, Pioneer Brass Works, George L. Paetz (upholstering supplies), T. B. Laycock & Sons Company (cushion springs), and the Easterline Company (lamps and starting and lighting systems). The value of the combined output of the automobile plants and allied industries for this year is estimated at \$41,000,000. In seven years the Indianapolis automobile industry has increased its output 680 per cent.

The J. M. Robinson Plant Not Sold.—On page 948 of *The Iron Age* of October 23 a paragraph was printed stating that "it is reported" that the plant of the J. M. Robinson Mfg. Company, manufacturer of sheet metal working machinery, Cincinnati, Ohio, had been acquired by the W. J. Baker Company, Newport, Ky. The J. M. Robinson Mfg. Company states that the report is unfounded, as it has no intention of disposing of its plant.

New Line of Horning and Wiring Presses

A new line of horning and wiring presses in four sizes has been brought out by the Cleveland Machine & Mfg. Company, Cleveland, Ohio. The machine is designed largely for the operation of wiring dies for wiring the edges of pails, cups, reflectors, etc. The special features of the company's line of inclinable presses that was described in *The Iron Age*, July 24, 1913, are also embodied in the construction of these machines. These include



One of Four New Horning and Wiring Presses for Use in Connection with the Manufacture of Pails, Cups, Reflectors, etc.

bronze bushings for the shaft bearings in the frame and the flywheel, a safety latch on the clutch pin, a larger diameter of the crank pin, a hinged brake band with compensating spring for wear and expansion and a quick adjusting knock-out device.

The frame is bored for a horn which may be either plain for holding, piercing or riveting dies, or of duplex construction for folding and locking side seams on pails, tubs, furnace pipe and other articles made of tin or light sheet metal. The screw adjustment under the knee permits that part to be set to any desired height for wiring dies of different depths. When using the press with a horn the screw is lowered and the knee is swung around out of the operator's way.

The principal dimensions and specifications of the machine illustrated, which is designated by the builder as the No. 24 size, are given in the accompanying table:

Distance to back from center of slide, in.	6
Size of bed and bolster plate, in.	11 x 16
Size of opening in bed, in.	6 x 10
Distance between bed and slide, stroke and adjustment up, in.	16
Stroke of slide, in.	1½
Adjustment of slide, in.	2
Thickness of bolster plate, in.	1½
Diameter of horn hole, in.	3½
Diameter of flywheel, in.	24
Speed of flywheel, r.p.m.	100
Weight of flywheel, lb.	275
Floor space occupied, in.	30 x 38
Net weight, lb.	1850

This press will close seams up to a maximum length of 12 in. and a diameter of twice that figure. The maximum diameter and length it will wire are 10 and 12 in., respectively.

Progress in Steel Mill Roll Design*

Development of Processes for Making Merchant Bars, Girder Rails, Tie Plates, Steel Piling—Achievements in Rolling Difficult Large Sections

BY THOMAS H. MATHIAS†

(Concluded from page 971, October 30, 1913.)

Merchant mill sections, such as rounds and squares, were among the first sections rolled on the early mills, and for years there appears to have been little change in the original methods, but about 1880-82 the Garret rod mills were designed, and that system of rapid breakdown grooves which were a decided advance over the early methods soon led to rapid advance in the small mill work. Old mills were dismantled and replaced by new types, and many Garret mills were soon in operation. The Garret method of breakdown passes was applied to larger mills with excellent results, and opened the way for great advance-

passes on all stands must bear a fixed relation one to the other within very close variations, and though they have been in use for but a comparatively few years, they are nevertheless being greatly improved. The roughing rolls for this type of mill must be made to cover a wide range of sections, as roll changes on them consume considerable time.

A design of the rolls for one of these modern mills is shown in Figs. 28 and 29. On this it should be noted that while there is shown but one size of each type of section, there are made from these same roughers a wide range of sizes of each of the various types shown.

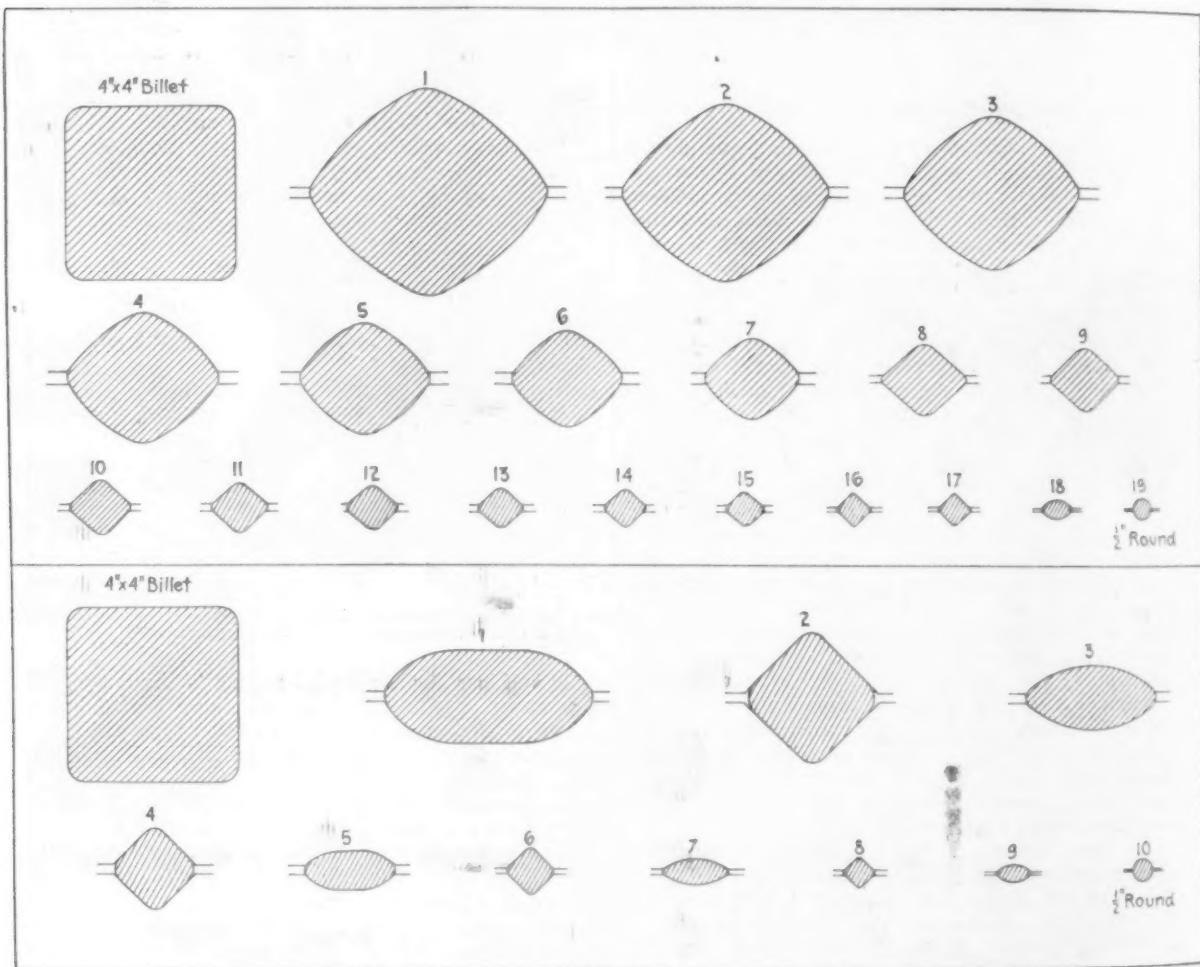


Fig. 27—Decrease in Number of Passes Formerly Necessary to Break Down a Billet to a Bar

ment in the rolling of small shapes for harvesting machinery of all descriptions: for manufacturers of carriages, bedsteads, automobiles, sash and door sections of the most intricate design, and many others.

An idea of the decrease in number of passes, due to increase in drafts, is given in Fig. 27, on which is shown the old style Gothic grooves numbering in all 19 passes, as formerly used to break down a 4 x 4-in. billet to a 1 1/2-in. round in comparison with a design of ten passes used in 1910 to accomplish identically the same work.

Small mills with continuous roughing stands are adopted for the most rapid use of the quick breakdown passes, and on these the speeds, diameters of rolls and areas of

*Paper presented to the American Iron and Steel Institute, Chicago, October 24.

†Assistant general superintendent, Lackawanna Steel Company, Buffalo, N. Y.

Progress in Designing Rolls of Small Specialties

A recent visit to one of the largest mills rolling small specialty sections very forcibly impressed the fact that roll designing had made remarkable progress along this line. Sections are now being rolled with apparent ease and minute accuracy and perfection of finish that would have been considered absolutely impossible even as recently as five years ago. There is probably no other branch of the industry that requires more careful attention to details, both as to the original designs as well as to the accurate turning of the rolls, and to the systematic recording and filing of templets, tools, etc.

This small mill work, where numerous sizes varying sometimes only by a few thousandths in size and impossible to detect by the eye, are placed in the same roll; where one roll may be used for numerous sections and in

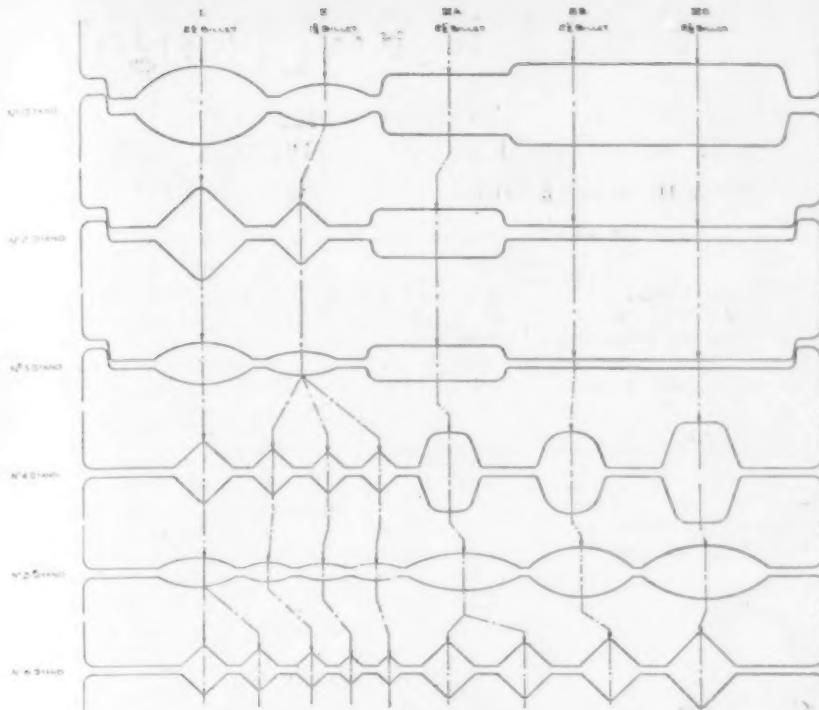


Fig. 28—Scheme of Continuous Roughing for Merchant Bars

all sorts of combinations, has come to be with its thousands of rolls and their varying changes of condition and diameter, a problem which requires of the roll designer most careful and explicit lining up, by means of charts showing the position of each size of pass, etc., of the mill operators in regard to the rolls and grooves they are to use.

Girder Rails

Early in the eighties the need for an improved type of section for street railways led to the development of the girder rail, first about $4\frac{1}{2}$ in. in height and from that to the 6, 7, 8, 9 and 10-in. sections now in general use. These were at that time rightly considered a difficult section to roll and, like other specialties when first made by one or two manufacturers, great secrecy was maintained as to the designs and mill appliances by the plants then producing them, but it was not long until the other mills had solved the problem for themselves and the making of girder rails and high guard rails had become common knowledge. For an idea of the general shape of the passes for one of these sections see Fig. 30, which shows the roughers, intermediate and finishing passes respectively.

Owing to the shape of the head on such sections as the Trilby and other grooved head guard or girder rails, an end wheel was used in the finishing groove. A box was located on the end of the rolls between the two necks. Through this hollow box was a pin on which the wheel revolved and extended into the open part of the finishing groove, where it was revolved by the friction of the hot bar as it passed through the horizontal rolls.

Tie Plates

According to the records the first flanged tie plate was rolled about

1880. This is believed to have been done somewhere in Canada. The first plate of this type in the United States was the Servis flat top plate with two horizontal flanges. This plate was $3\frac{3}{4}$ in. wide, and was rolled at the old Troy Rolling Mill Company. Later it was made by the Pennsylvania Steel Company, and still later by the Bay View plant of the Illinois Steel Company at Milwaukee. The plate was later increased to $4\frac{1}{4}$ in. in width and rolled with three flanges. Some years later a 5 and 6-in. plate of same pattern was rolled, but a majority of the plates up to ten years ago were of the $4\frac{1}{4}$ -in. width and were not more than $\frac{3}{16}$ or $\frac{1}{4}$ in. in thickness.

The first Wolhaupter corrugated top plate was made in 1895 by the Springfield Iron & Steel Company. This plate has since been greatly improved in design, and in 1906 or 1907 the first of the present type of extremely high-shouldered corrugated top plates with longitudinal flanges was rolled.

A section of the finishing groove for one of the late plates, showing the milled-out shoulders, is given in Fig. 31.

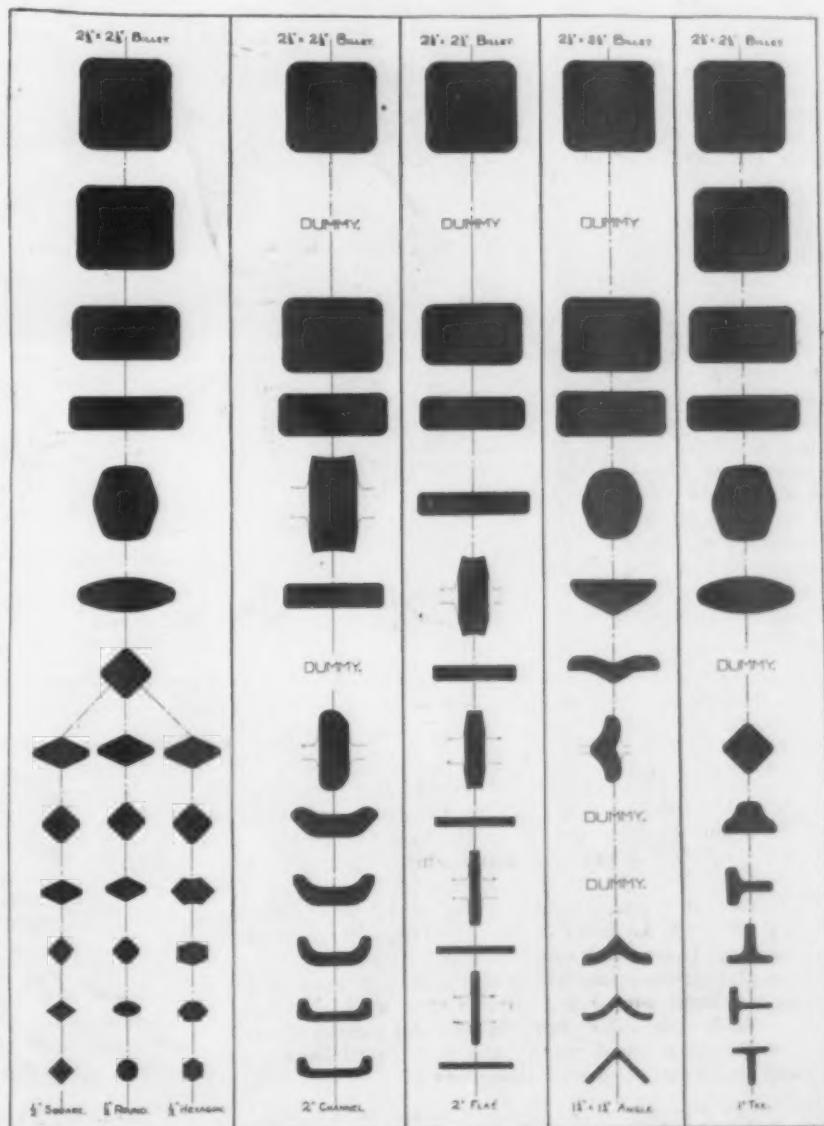


Fig. 29—Scheme of Rolls for Continuous Roughing for Merchant Bars

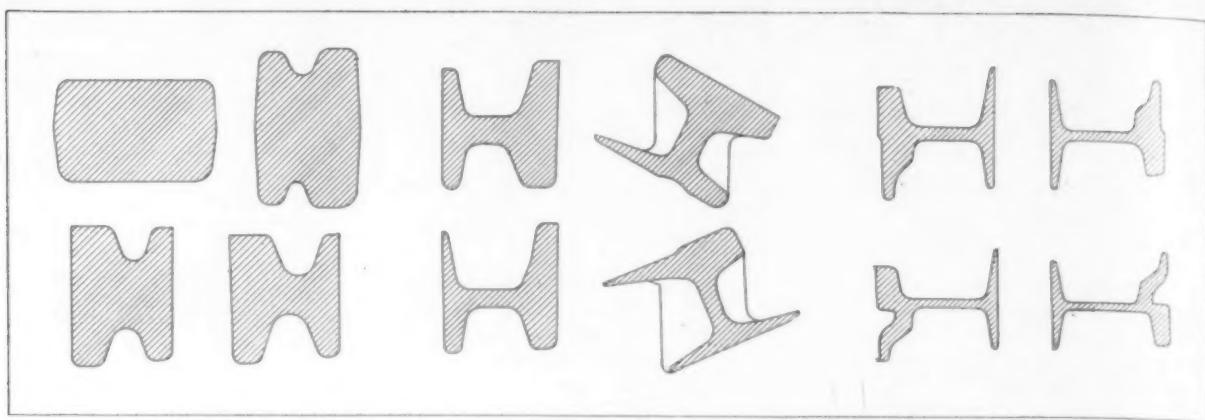


Fig. 30—Roughing, Intermediate and Finishing Passes for Rolling Girder Rails

and the finished plate is shown in Fig. 32. A feature of the method of rolling these shoulder plates is the making of the shoulder side of the plate on a sleeve or ring which fits snugly on a mandrel and keyed thereto. On the ends of the latter are the necks or journals on which it revolves when in use.

A general outline of the rolls and arrangement of grooves in roughing, strand and finishing rolls for the new style hook shoulder tie plate is shown in Fig. 33. The hook feature itself is an old device but with a continuous hook shoulder rolled on the plate it would be impossible to shear the plate without damaging the hook so that it would not fit the rail flange. Sawing was too expensive an operation, hence the alternating hook shoulder was designed so that between each hook there was a space large enough for the shear blades to act without touching the bent over part of section.

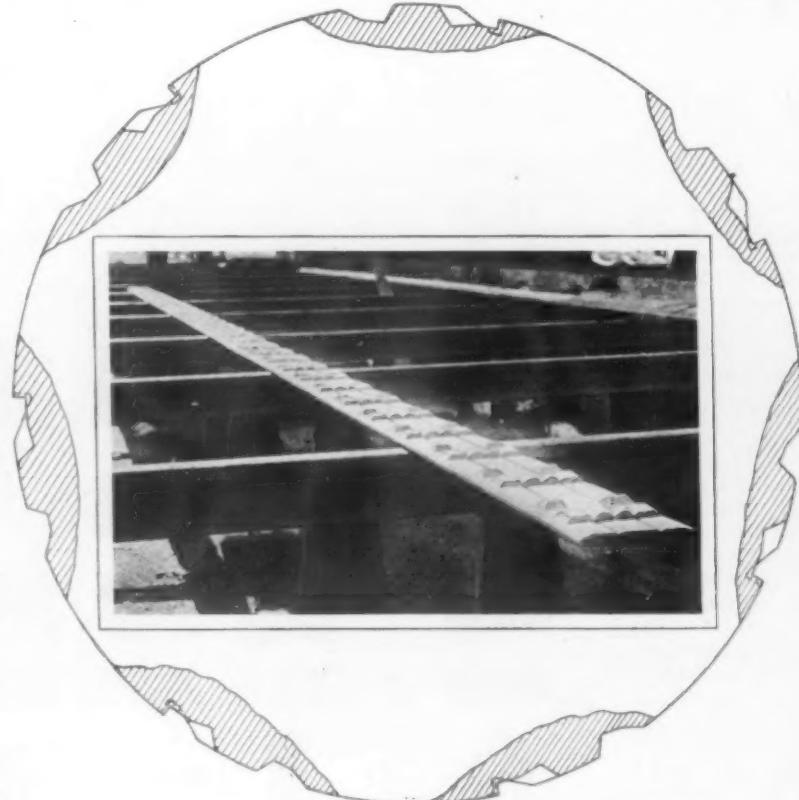
Steel Piling

Other types of modern sections which aid greatly in the engineering feats of to-day are the steel piling sections, which within the last few years have come into great demand and bid fair to be sections which will

require very large tonnages. The rolling of one of the first of the leading sections was accomplished by the use of the diagonal passes as shown in Fig. 34, although since that time a section of the same general pattern has been made with rolls of the usual straight collared design, as shown in Fig. 35. This was a case where the diagonal or oblique method was not essential to the successful rolling of the section, and where the designer was free to make a choice of method

choice will appear later.

Following this came the sections of piling, as shown



Figs. 31 and 32—Tie Plate and Section of Finishing Groove There or

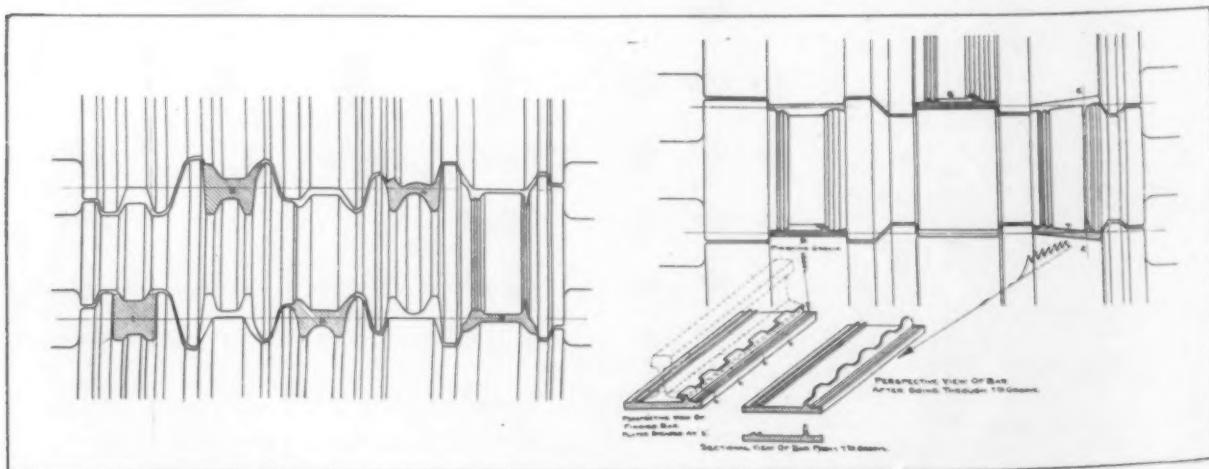


Fig. 33—Outline and Arrangement of Rolls for the Hook Shoulder Tie Plate

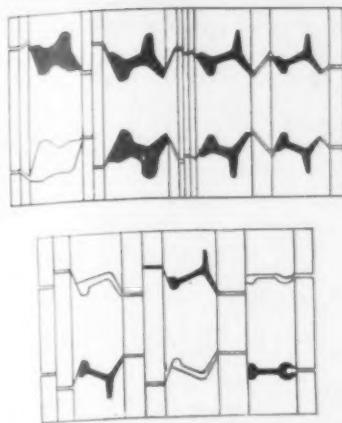


Fig. 34—Sheet Piling in Diagonal Passes

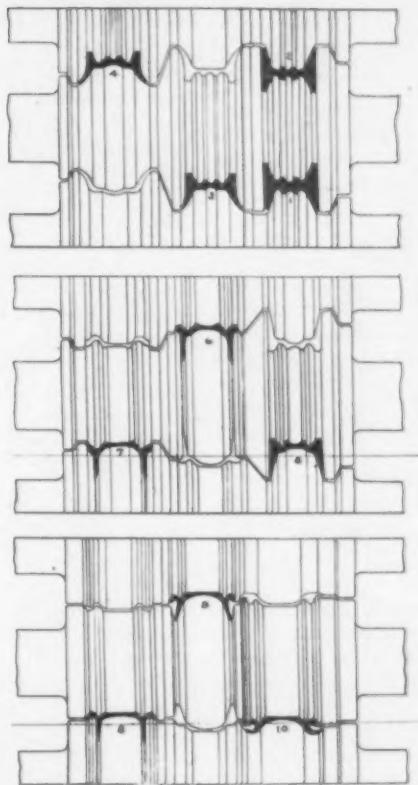


Fig. 35—Later Form of Sheet Piling

in Fig. 36. Designs of piling representing both the single and double lock are now rolled in various lengths and gauges.

Steel Ties

One of the latest achievements in roll design is that of the steel tie. For some years past the manufacturers of these ties have been rolling smaller sections, but recently a 10-in. flanged section $6\frac{1}{2}$ in. high and with very slight taper on the very thin flanges has been successfully rolled at the Homestead works of the Carnegie Steel Company. This has been accomplished by the aid of the above-mentioned diagonal or oblique grooves.

The diagonal or oblique method of roll designing has been in use for many years, but it is only recently that it has been applied vigorously, with the result that it has made it possible to reduce the number of passes in rolling. And of even more importance than the decrease of the number of passes is the fact that by its application sections heretofore considered impossible have been successfully rolled; for instance, the 10-in. tie referred to. This is considered a case where it was necessary for the designer to use the oblique method for securing the flanges which are extremely long and thin.

Development from Ingot to Finished Product

This is represented by three and sometimes four distinct stages of reduction. In the first instance, it is from the ingot to rectangular or shaped bloom to the finished bar. In the second instance, from the ingot to the rectangular bloom, to billet, to the finished bar. This will be seen by reference to Fig. 37.

Great achievements in the designing of rolls for shaped sections have been made in the past 25 years; for instance, the rolling of girder and high guard rails at the Pennsylvania works at Steelton, the Cambria works at Johnstown, and the Lorain steel plant in Ohio. Also the rolling of 24-in. beams at Homestead direct from the ingot without reheating on a combination one stand 40-in. blooming mill and a four stand 35-in. finishing mill.

At Pencoyd the problem was to

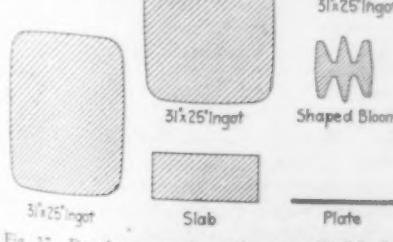


Fig. 37—Developments from Ingot to Finished Product

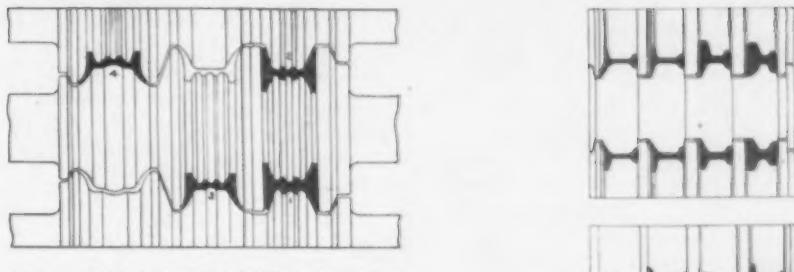


Fig. 36—Sheet Piling in Straight Collar Rolls

roll a 24-in. beam on a 23-in. mill. In this case the shaped bloom was reheated, thus making it possible to roll a large section of this weight and size on rolls of so small a diameter. The rolling of the 24-in. beam at that time (about 1893) was the more remarkable on account of the handicap under which the designer had to labor for his results.

What these men of nearly a generation ago accomplished has been of great assistance to the designer of to-day, and much of that now being done is but a natural progression based on the knowledge gained by the earlier results. Each of the more noted recent developments of difficult large sections and many of those of the small merchant sections has opened up a field for further endeavor that will undoubtedly lead to still greater progress in the future.

Discussion

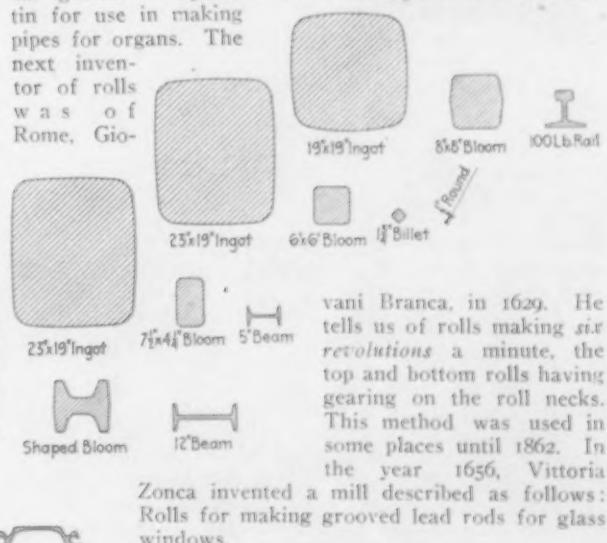
By Henry L. James, Superintendent Roll Department, American Bridge Company, Pencoyd, Pa.

In my research I found records by Solomon DeCaus dating back to 1615, of a mill for rolling sheets of lead and tin for use in making pipes for organs. The next inventor of rolls was of Rome, Gio-

vanni Branca, in 1629. He tells us of rolls making six revolutions a minute, the top and bottom rolls having gearing on the roll necks. This method was used in some places until 1862. In the year 1656, Vittoria Zonca invented a mill described as follows: Rolls for making grooved lead rods for glass windows.

Rolling Mills in England

In 1728 a mill was constructed in England and shipped to France. The rolls were 5 ft. in length and 16 in. in diameter, containing seven grooves for rounds, the largest being 4 in. and the smallest 2 in. in diameter. This mill was a prophecy of our present day reversing mill, its reversal being accomplished by a lever operating a clutch with suitable gearing. They also had roller tables in front and back; the rollers were 4 in. in diameter and 12 in. center to center. A British patent No. 505, granted to John Payne, November 21, 1728, says in the specifications:



"Hammered bars are made to pass between two large metal rollers which have proper notches or furrows upon their surface, into such shapes and forms as shall be required."

In 1772 Mark Homer received a British patent for rolling iron or copper. William Bell, of Birmingham, was granted one in 1779. This brings us to January 17, 1783, and the name familiar to us all—Henry Cort.

Rolling Mills in Sweden

Christopher Polhem, of Sweden, 1661-1751, was another believer in the possibilities of rolling metals. In his "Testament" he notes the gain in time by rolling over the old method of hammering, as in the time it would take to tilt one bar with the hammer, a rolling mill can produce ten to twenty times as many. He also advocated the use of mills for rolling very thin bars of iron for hoops and mountings and the rolling of steel for knife blades; the rolls to be so made that the knife steel becomes broad and thin on both sides or will get the same shape as common swords, and is then cut lengthwise in two parts, thus giving suitable material for knives. He also thought of the value of making rolls for producing rounds and half rounds.

Roll Designing To-day

Roll designing to-day is truly different in many respects from that of years ago, on account of new lay-outs in mill construction, such as the introduction of tables instead of men around the rolls. The enormous tonnage required from the rolls is another factor.

Roll designing is squeeze, spread and bend. We have to consider the different grades of steel. Some steel will not spread the same as other steel, being stiff and hard; it will not flow easily, especially in flanging; in other steel there is no trouble in getting the required size. The heating of the material must also be considered, as different steels require different temperatures. Proper initial heat is absolutely

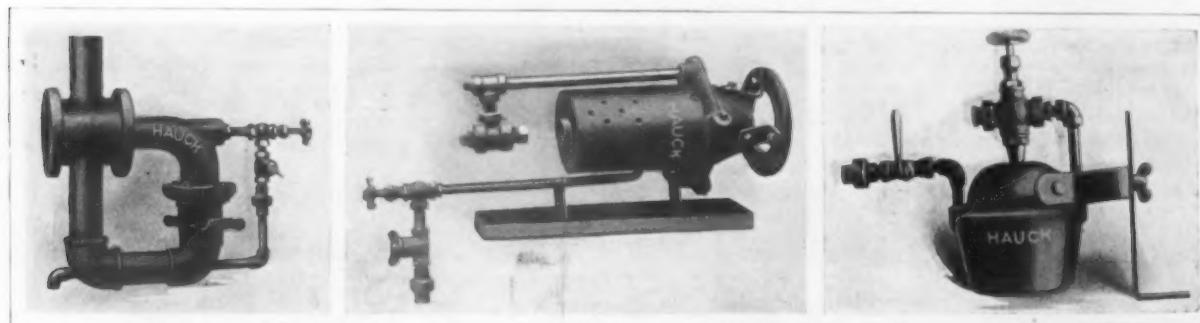
Three New Furnace Burners Using Oil as Fuel

The Hauck Mfg. Company, 140 Livingston street, Brooklyn, N. Y., has recently developed three types of oil burners for furnaces of various types. One of the burners is used for kerosene only, while the other two are to employ practically any grade of crude or refined oil or tar at either high or low pressure. The burners are for use in connection with annealing, crucible, ladle heating and babbitt, lead and brass melting furnaces, core and mold drying ovens and for preheating, drying sand, melting steel, etc.

The low-pressure oil burner is designed for operation with air under pressures between 6 and 12 oz. with such fuels as tar or any grade of heavy low-gravity crude oil, such as Mexican, Texas or California crude oil or refined oil. The air and oil are preheated, and it is pointed out that the same results are secured as if a much higher pressure were used. The burner can be started with a match. The low-pressure burner is made in two sizes, and if desired can be furnished for use with a positive air pressure of 1 lb. or more. Emphasis is laid upon the fact that the good results secured with this burner are due to the use of a single combustion chamber for each burner.

The kerosene oil burner is recommended for use where air blast or pressure is not available and more especially for annealing and forging furnaces. The oil is vaporized and burns with a strong, reddish blue flame. With this type of burner it is necessary to carry oil pressure of 25 to 150 lb., this pressure being secured by the use of a hand pump. The burner is mounted on a flange at the proper distance and can be attached to any furnace. It can be furnished in five different styles, according to the requirements of the particular work which it is called upon to do.

The high-pressure burner employs the same fuels as the low-pressure unit, but is operated with steam or compressed air under a pressure of 30 to 100 lb. The oil and the air are



Low-Pressure Oil Burner

Burner for Kerosene Oil

High-Pressure Oil Burner

Three Recently Developed Types of Burners for Furnaces Using Oil of Various Grades for Fuel

necessary to get good results. From the financial stand-point, heat is an important factor, as material not properly heated wears and breaks the rolls. This is one of the objectionable features in a continuous furnace with pipes. These cause black spots, which must be eliminated in large structural shapes.

In former years tonnage was not the vital question that it is to-day. The production of the section was the roll designer's chief aim. If 70 tons of rail were finished in 12 hr., that was a big day. Now, they will produce 1400 to 1600 tons in the same time. The completion of 40 tons of structural shapes in 12 hr. was big work, but how does it compare with the present day records of 1200 tons in 12 hr? Of course, new lay-outs in mill construction, such as tandem mills, zig-zag mills, separate engines, motors and speeds have been big factors, but the roll designer had to meet the new conditions.

C. W. Kanelt, in Technological Bulletin No. 10, United States Bureau of Standards, gives recent determinations of the melting points of refractory materials. Tables show the distinct flowing point of silica to be 1760 deg. C., although it may appear to melt at 1600 deg.; Bauxite brick melted at 1790 to 1820 deg. C.; pure alumina at 2010 deg. C.; one brand of magnesia brick at 2165 deg. C., and two samples of chromite brick at 2050 and 2180 deg. C. respectively. The necessary detailed analyses are given in the tables.

preheated in the same way as in the low-pressure type and where steam is used instead of compressed air, it is superheated in the burner nozzle. The results secured are said to be as good as if compressed air were employed. The bracket on the burner provides a means of adjustment which enables the burner to be used in different positions. After the proper distance is found, the burner can be locked there.

The International Oxygen Company has been obliged by the steadily increasing demand for oxygen and hydrogen generating plants to remove its executive offices from 115 Broadway, New York City, to its works at Newark, N. J. Additional buildings have been erected to house the executive offices and provide greater manufacturing room for the increased demands made upon the plant. The improved facilities will permit the company to handle a much larger volume of business than at present. The general sales offices will remain at 115 Broadway, New York.

According to a review of the machine and electrical industry in Germany in the *Frankfurter Zeitung*, in the 12 years between 1895 and 1907, the number of persons engaged in machine and allied manufacture has doubled, the total for 1895 being 582,000, and for 1907, 1,120,000. Since 1907 the increase has been even more rapid.

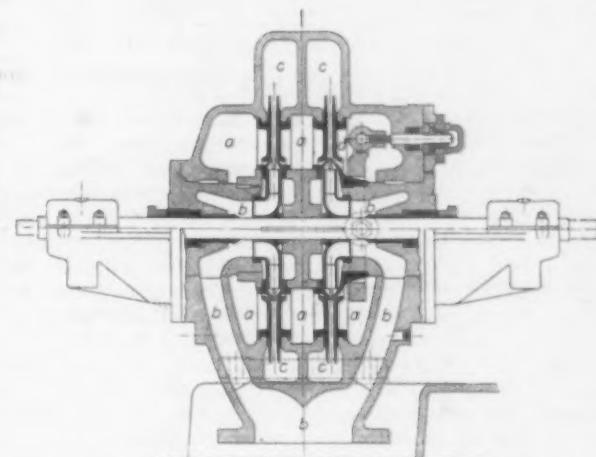
A Centrifugal High Vacuum Air Pump

An interesting centrifugal pump for high vacuum service has been placed on the market by the C. H. Wheeler Mfg. Company, Philadelphia, Pa. This pump is made according to the design of Thyssen & Co., Mulheim-Ruhr, Germany, the Wheeler Company having secured the manufacturing and selling rights in the United States and Canada. The pump is practically a double-impeller single-stage centrifugal unit with a horizontally divided case and can be built for a wide range of capacities up to 15,000 kw. in one unit, speeds of from 1000 to 3000 r.p.m. being permissible. A combination for use in connection with surface, jet and barometric condensers is possible with this machine, as will be noticed from the accompanying view of an installation for taking care of 3500-kw. steam turbine. The apparatus from left to right are a circulating pump, a steam turbine for driving the outfit, the Thyssen air pump and the hot well pump.

In the sectional elevation drawing is shown how each impeller discharges into an annular nozzle from which the water emerges in a thin film of high velocity, entraining the air from the condenser through an annular diffuser or conversion throat and discharging the mixture against atmospheric pressure. In this drawing *a* represents the air suction chambers, *b* the water suction passages and *c* the water and air discharge passages. The moving element consists of two single-stage impellers mounted right and left hand on a driving shaft, with a disk carrying two nozzle rings mounted between them. There are four of these rings in all, the other two being separate and stationary. One of these is attached to the casing and the other forms a sliding sleeve which is controlled by a hand operated external adjustment, so that it may be moved axially, thus varying the width of opening between the rotating stationary ring to regulate the quantity of water for a given speed and temperature of entraining water.

In operation the entraining or hurling water is drawn into the pump as in an ordinary centrifugal unit and is discharged by the impellers in two parallel films. Each

pumped by the two impellers through the annular openings of equal width between the two sets of nozzle rings. The ordinary position for the pump is over a small tank,

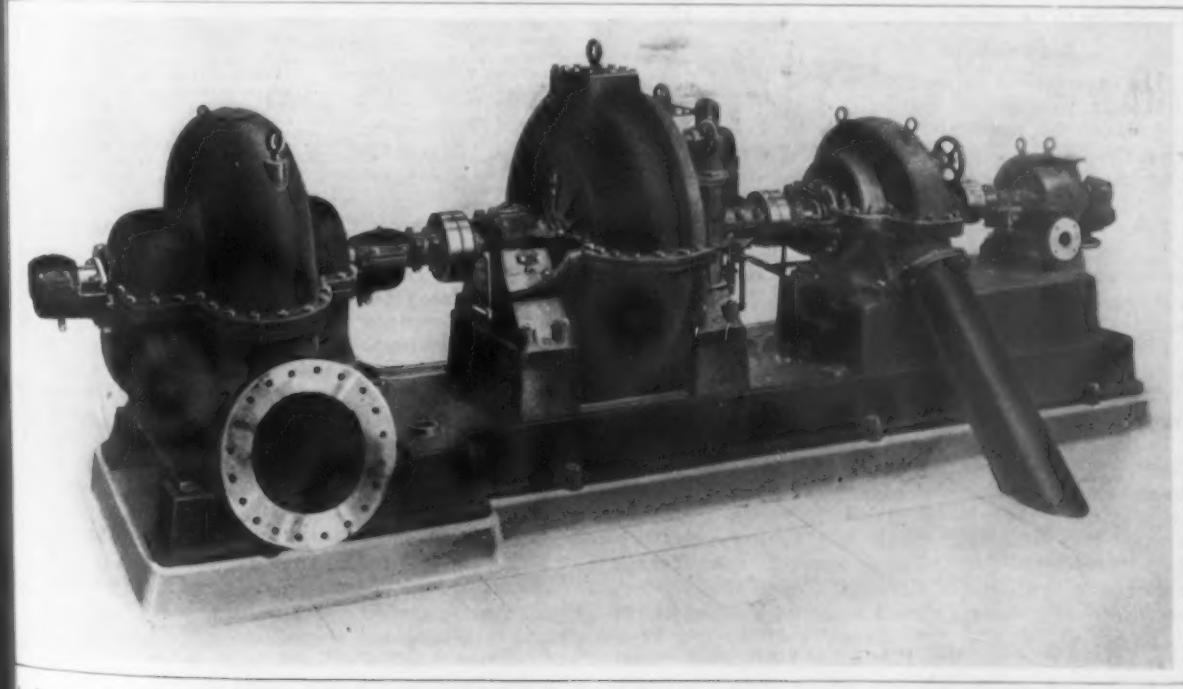


A Sectional Elevation of the Pump Showing the Arrangement of the Various Parts

but it can be arranged to draw and discharge the entraining water in parallel with the circulating pump, if this is found preferable.

Buchanan Crushing and Concentrating Machinery

The C. G. Buchanan Company, 90 West street, New York, states that the royalty agreement under which the Cresson-Morris Company (formerly the George V. Cresson Company), Philadelphia, Pa., manufactured and sold the Buchanan crushing and concentrating machinery has expired by limitation. Arrangements have been perfected with the Birdsboro Steel Foundry & Ma-



An Installation for Taking Care of a 3500-Kw. Steam Turbine Consisting of a Circulating Pump, the Steam Turbine, the Thyssen Air Pump and the Hot Well Pump

discharge nozzle consists of a stationary and a revolving ring by which the particles of water are given a swirling movement that increases the air entraining effect of the water leaving the nozzle rings. To permit the impellers to retain their central position under the nozzle rings with varying positions of the adjustable ring a small lateral movement of the shaft endwise is immediately followed by a movement of the shaft endwise, thus bringing the pump instantly into hydraulic balance by discharging the water

chine Company, Birdsboro, Pa., under which it will manufacture this machinery. The Buchanan Company owns all the patents, patterns, etc., of the machinery above referred to, and under the contract with the Birdsboro Company will have sole charge of sales, the Birdsboro Company making the deliveries and billing and collecting. Orders or communications relating to sales or the supplying of new and repair parts should be addressed to the Buchanan Company.

The Status of the Steel Carwheel*

The History of the Development and the Manufacturing and Commercial Problems of the Introduction of the Solid Steel Wheel

BY JOHN C. NEALE†

A steel tired wheel on a cast steel center has been, in the minds of users, entirely satisfactory with the one exception—that of loose tires, but devices for holding the tire in place have been perfected to such an extent that loose tires are not prevalent except when the tires become well worn. This loose tire feature, while possibly not a serious factor, must have suggested opportunity for improvement, and undoubtedly caused many people to give considerable thought to making the entire wheel of one piece. The difficulty was to design machinery of sufficient strength and simplicity to produce perfect results. The first rolling machines were constructed simply for the purpose of truing the rim of the cast iron or cast steel wheels rather than to produce a solid rolled wheel from a bloom or ingot.

Charles T. Schoen began to experiment with the manufacture of the rolled steel carwheel in 1898, and had associated with him Henrik V. Loss, of Philadelphia. The first patent covering the manufacture of what is now known as the Schoen steel wheel was taken out by Mr. Loss on August 12, 1902, No. 706,674, covering a machine for rolling carwheels from circular ingots. The wheel itself as an article of manufacture is covered by Loss patent No. 746,538, issued December 8, 1903, for a one-piece forged and rolled steel wheel having the hub and approximately one-fourth of the adjacent web forged, and the axle hole punched, and the remainder of the web and the rim rolled to a finish. The apparent fact that a solid rolled steel wheel could be made fairly economically, together with his conviction that there would be a demand for such a wheel under heavy capacity freight cars, caused Mr. Schoen to organize a company for their manufacture.

Beginnings on a Commercial Scale

The organization of the Schoen Steel Wheel Company on May 11, 1903, and the beginning of the manufacture of steel wheels by the Standard Steel Works Company in the early part of 1904, marked the first step in the second period of this industry. This period may be said to have extended from 1903 until July, 1908.

From the start the serious problem seemed to be what quality and form of steel blank should be used, and, as was natural, the first blanks were made by casting circular steel ingots, with which the first forging operations were started. These wheels, which were first made December 5, 1903, were quite successful as far as outside appearance went, and as defects were discoverable only by service, the manufacturers' efforts were devoted to introducing experimental wheels into various kinds of service.

In 1904 the Schoen company sold 748 36-in. tender wheels, 378 36-in. passenger carwheels and a few miscellaneous size wheels, a total of 1134. In 1905 their success was quite remarkable in that their sales materially increased, the total being 22,332, the Pennsylvania Railroad, Philadelphia Rapid Transit Company and Transit Development Company of Brooklyn buying about 50 per cent., the Pennsylvania Railroad installing 3800 in freight car service. The year 1906 showed over 100 per cent. increase over 1905, the year's sales reaching 58,590, 14,000 of which went into freight car service. Their sales in 1907 were 54,476, of which 20,500 went into freight-car service, but in the first six months of 1908, probably due to financial conditions, they were unable to sell more than 9363 wheels.

As far as the Schoen company was concerned, they utilized in the manufacture of wheels the cast steel blank about a year, and in the fall of 1904 they changed their process to the extent of using a blank cut from a slab.

*Paper substantially in full read before the American Iron and Steel Institute, Chicago. The few paragraphs omitted outlined briefly the United States patents issued to cover the rolling of wheels, dating from July, 1854.

†Structural engineer, Carnegie Steel Company, Pittsburgh, Pa.

This blank was about 27 in. square and 5 in. thick, varying according to the size and dimensions of the wheel made. The use of this blank was continued until the spring of 1911, when, on account of the invention of a special shear, it became possible to roll an ingot into a round about 15 in. in diameter, and with this shear cut the blank economically into the lengths required to produce the wheel desired.

I consider that the third and last step in the history of solid rolled steel wheels began about July 1, 1908, the wheel having gone through all its experimental stages and being recognized by both users and manufacturers as a merchantable product, over 200,000 being in service. At this time the Carnegie Steel Company purchased the Schoen Steel Wheel Works, and Midvale Steel Company, Standard Steel Works Company and Forged Steel Wheel Company were all making wheels on a commercial basis. Greater output and experience in manufacturing early brought about considerable reduction in the price, which made the wheel even more popular and available for the railroad companies, and as an illustration of this, in the last six months of 1908 the Carnegie Steel Company alone sold 57,000 wheels; in 1909 it sold 269,000 wheels; in 1910, 150,000; in 1911, 105,000; in 1912, 206,000, and for the first half of 1913, 147,000.

The General Methods of Manufacture

It is interesting to note that the chemical and physical properties of the wheels manufactured by all four companies are approximately the same, being as follows:

Chemical properties:

Carbon	0.65 to 0.85
Manganese	0.60 to 0.85
Silicon	0.08 to 0.25
Phosphorus, not to exceed	0.05
Sulphur, not to exceed	0.05

Physical properties:

Elastic limit, lb. per sq. in.	70,000
Tensile strength, lb. per sq. in.	125,000
Elongation in 2 in., per cent.	10
Reduction of area, per cent.	12

but that there are radical differences in the methods of preparing the steel and forming a wheel.

One manufacturer starts with an ingot which is rolled into a flat slab, from which are cut square blanks, which are then sheared to circular form and forged into a wheel; another starts with a long polygonal ingot, which is parted in a lathe into short cylinders, which are then forged and rolled. A third starts with a small ingot cast individually for each wheel, which is forged and rolled similar to the second method, and the fourth starts with a long ingot rectangular in section, which is rolled into a round bloom or billet, this round billet being cut into short cylinders forming the individual wheel blank, which is then pressed and rolled similar to the second method.

The question of variation in quality of the different wheels, due to the different manufacturing methods adopted by the four solid wheel makers, has caused a great deal of theorizing and discussion, especially as every solid wheel maker has undoubtedly made both good and bad wheels. Results as demonstrated by actual service are, after all, what count, and the fact that there is not in the minds of railroad companies a great difference in their respective qualities is set forth by the fact that the majority of the mechanical people tell their purchasing agents that any one of the four makes is acceptable to them.

The general process used by the three companies that forge and roll their wheels is about as follows: The blank obtained is forged into a crude form, only slightly resembling the outlines of a wheel, by means of a 7000 to 10,000-ton hydraulic press fitted with dies designed to force the metal from the portion of the blank which is eventually to become the web of the wheel into the hub

and rim. The piece is heated and forged a second time, the dies used in this process being so shaped as to produce a form a little nearer that of the finished wheel. At this stage the flange of the wheel first appears. After the second forging process the hub is punched and the embryonic wheel is given a wash heat for the removal of scale, preparatory to its rolling.

The rolling mill is a most intricate and complicated piece of machinery. The wheel is placed on a spindle in a vertical position, so that it is engaged by five distinct rolls. Two bear with great force against each side of the web, at the same time exerting pressure on the inside of the rim. Two more engage opposite faces of the rim, and the fifth roll resists longitudinal pressure of the web rolls and bears against the tread and flange. The action of the web or driving rolls rotates the wheel on its spindle. The rolling is continued until all irregularities disappear and the wheel has reached the proper diameter.

From this point the wheel is put through certain finishing processes. The first of these is dishing or coning. When placed in the coning press the wheel is symmetrical, i. e., a plane passed through the center of the web also cuts the center of the tread and divides the hub in half; in other words, the hub projects an equal amount beyond each face of the rim. After coning under 1200 tons pressure, the hub projects beyond the back face and recedes from the front face of the rim. Under the same press the wheel is made truly round by compressing its circumference in a die composed of segments of a circle of the proper radius. The wheel is now ready for the machine shop, where the hub is bored, and, if for other than freight car service, the tread and flange are machined.

The other manufacturer heats the slab which he obtains after rolling an ingot, and fabricates it under heavy hydraulic pressure in enclosed dies in such a manner as well-nigh completes the formation of the hub and plate, quickly withdraws it and places it in a second press where the embryo wheel is held by its hub and plate, is pierced through the hub to within a fraction of an inch of the rough-bore desired, and the entire hydraulic power of the press is brought to bear upon the rim of the wheel, or upon its allowable wearing body, the tread and flange. After being properly cooled, the wheels are machined to required dimensions.

Problems of Manufacture

This condensed history of the steel wheel with its apparently rapid growth and quick perfection of product would indicate that its success carried few problems, but such was not the case, as I believe there were as many problems confronting the manufacturers of wheels as of any other article, if not more, and the overcoming of the difficulties in such a short time seems almost miraculous.

In the first place, the quality of steel required was exceedingly exact. It had to be hard, free as possible from pipes and segregation, and then great care had to be taken in heating the blank. The early wheel showed shelling when in service, and this shelling seemed to be greater in the solid wheel than in tires.

The next difficulty was the one of standardization. In steam road service the sizes were fairly fixed, such as diameters, contours of tread and flanges and size of hub, but the thicknesses of rim were different, according to the ideas of the motive power superintendents.

The objection which was always present in steel tires—that of turning, and the corresponding reduction in size, necessitating adjustments in brake-rigging and installation of machinery for performing this turning—faced the manufacturer when trying to introduce solid wheels into this service. He had little to offset these disadvantages in the way of price; the high cost of the blanks, and the great amount of work required to manufacture the wheels from the blanks, ran his cost up to a point where a steel wheel had to be sold at a higher price than a tire, almost as much as a tire and center combined, so that with a center having a life equivalent to that of two or sometimes three tires, it ultimately cost the buyer less to use steel tired wheels than it did to use solid steel wheels. In the one case he was buying a known and in the other an unknown commodity.

These troubles, while great as far as steam roads were concerned, were far greater when applied to electric lines, where the necessity for interchange did not force the adop-

tion of a common standard, the diameters varying even for the same service. Very few used the same width of rim, height of flange was different and the contour of tread and flange varied in accordance with the ideas of the superintendents of car equipment, while the length and projection of hub were very rarely the same. In fact, on the same system and for the same type of car, different hubs were often required. Here again the necessity for turning naturally compelled the installation of machinery, blocked their sale, as electric roads could not afford the expense; besides the amount of reduction in diameter was limited by the clearance of the motor and steps, and it was often necessary to secure a reduction of 2 in. in height or 4 in. in diameter, in order to show economies.

Despite these obstacles to their immediate success, the inherent advantages of the steel wheel were sufficiently apparent to induce electric roads to try them out, and their present popularity is sufficient proof that the advantages outweigh the disadvantages.

Accuracy of Manufacture

To those who have had little experience in the manufacture and use of steel wheels, it should be interesting to note the accuracy with which a wheel has to be made in order to be merchantable, and while considering these tolerances, do not forget that a wheel is different from any other rolled article, in that there is no place for extra metal to go. It cannot elongate the piece without impairing the section, as the material can in longitudinal rolling; nor can the wheel contract when cooling to any appreciable extent without warping or losing its rotundity. The one important thing discovered which takes care of this feature is the dishing of the web, but this immediately affects the relation of the face of the hub to rim.

A list of the tolerances mentioned above are:

- (a) Height of Flange.—The height of flange shall not be less, but may be $\frac{3}{8}$ in. more than that specified.
- (b) Thickness of Flange.—The thickness of flange shall not vary more than $\frac{1}{16}$ in. from that specified.
- (c) Radius of Throat.—The radius of throat shall not vary more than $\frac{1}{16}$ in. from that specified.
- (d) Thickness of Rim.—The rim may vary in thickness, but the variation less than that specified shall not exceed $\frac{3}{16}$ in. The thickness of rim shall be measured from a base line drawn from the intersection of the throat radius and the tread, parallel to the axis of the wheel.
- (e) Width of Rim.—The width of rim shall not vary more than $\frac{3}{16}$ in. from that specified.
- (f) Thickness of Plate.—The plate may vary in thickness, but the variation less than that specified shall not exceed $\frac{1}{32}$ in. for each $\frac{1}{8}$ in. in the thickness of the plate.
- (g) Limit Groove.—When limit groove is specified, the location of the center of limit-of-wear groove shall not vary more than $\frac{1}{16}$ in. from that specified, and its distance from the inner edge of the rim at the thinnest point shall not be less than $\frac{3}{16}$ in.
- (h) Diameter of Rough Bore.—The diameter of rough bore shall not vary more than $\frac{1}{16}$ in. over nor more than $\frac{1}{8}$ in. under that specified. When not specified, the diameter of rough bore shall be $\frac{1}{8}$ in. less than that of the finished bore, subject to the above limitations.
- (i) Diameter of Hub.—The diameter of hub may vary, but the thickness of wall of the finished bored hub shall not be less than $\frac{1}{16}$ in. at any point for bores 7 in. in diameter or under, nor less than $\frac{1}{16}$ in. for bores over 7 in. in diameter, unless otherwise specified. The thickness of wall of the hub shall not vary more than $\frac{3}{16}$ in. at any two points on the same wheel.
- (j) Length of Hub.—The length of hub shall not vary more than $\frac{3}{16}$ in. from that specified.
- (k-1) Depression of Hub.—For passenger-truck wheels and wheels of similar design, the depression of hub below the front face of rim shall not be less, but may be $\frac{3}{16}$ in. more than that specified.
- (k-2) Projection of Hub.—For engine-truck wheels and wheels of similar design, the projection of hub from the back face of rim shall not be less, but may be $\frac{3}{16}$ in. more than that specified.
- (l) Black Spots in Hub.—Black spots in rough bore within 2 in. of either face of the hub shall not exceed $\frac{1}{16}$ in. in depth.
- (m) Eccentricity of Bore.—The eccentricity between the tread at its center line and the rough bore shall not exceed $\frac{3}{64}$ in.
- (n) Block Marks on Tread.—Block marks shall not exceed $\frac{1}{64}$ in. in height.
- (o) Rotundity.—The wheels shall be gauged with a ring gauge, and the opening between the gauge and tread at any point shall not exceed $\frac{1}{32}$ in.
- (p) Plane.—The wheels shall be gauged with a ring placed concentric with a perpendicular to the axis of the wheel. All points on the back of the rim equidistant from the center shall be within a variation of $\frac{1}{16}$ in. from the plane of the gauge when so placed.
- (q) Tape Sizes.—The wheels shall not vary more than five tapes under nor more than nine tapes over the size specified.
- (r) Mating.—The wheels shall be mated as to tape size and shipped in pairs.

These tolerances have only been generally accepted for two or three years, and in the early days of the steel wheel each buyer had a different idea as to what each should be.

Usefulness of the Steel Wheel

It soon became evident, after the difficulties of introducing a new article had been overcome and a reasonable number were in service, that if the blanks were made of good steel, and properly worked in the wheel plant, the steel wheel was a good substitute for the steel tired wheel up to 38 in. in diameter, this being the largest solid wheel any one tried to make, and the early problems were to sell them in competition with this product, and at equal or slightly less figures they were purchased and used in substitution for steel tired wheels, the mileage for like service being practically the same.

The increase in the capacity of freight cars necessitated stronger wheels than were heretofore used, which caused the Pennsylvania Railroad to experiment with steel wheels under this class of equipment in 1905. The success they had with them established beyond doubt the fact that if the process of manufacture could be sufficiently perfected to reduce the cost, they would be universally used. This caused the manufacturer to study how to make a cheaper wheel for this service, and with the co-operation of some of the railroads, they secured concessions in tolerances sufficient to enable them, with more experience and better equipment, to roll a wheel close enough to size and contour to answer the purpose of this service without machining the tread and flange. This enabled the manufacturer to reduce his cost to a place where substantial economies could be shown in their use.

The average mileage of freight cars is rarely more than 9000 miles per year, so that practically no service tests showing the total life of a steel wheel under this service have been secured up to the present time. The best record obtainable is that of wheels which were installed early in 1906 under 100,000 lb. capacity coal cars for the Berwind-White Coal Company, which were marked to 110,000 lb., with the usual 10 per cent. overload. These cars were in regular service from their mines in Windber, Pa., near Johnstown, and have averaged between 22,000 and 25,000 miles per year over a mountainous grade. Since their installation they have been entirely satisfactory, practically none of them having been removed, and most of them have run 140,000 miles. Some have even gone as high as 170,000 miles, and due to the use of steel wheels, making it unnecessary to shop their cars for wheel repairs and replacements, they can carry their coal with 10 to 15 per cent. less cars.

There is no longer any argument about the advantages of steel wheels as far as strength and safety are concerned. The chief objection seems to be large first cost, but I am sure that it will be but a short time until this objection is overcome for the reason that the first cost can easily be justified when it is realized that the annual sinking fund it is necessary to set aside each year for the accumulation of money to pay for a new wheel when the first one is worn out, together with the interest on the original investment, is quite considerably less than what would be required to provide a sinking fund and pay interest on the investment for cast-iron wheels. This statement is based on the life that we are justified in assuming from past service a steel wheel under this service will have, and what the past has shown is the life of cast-iron wheels.

I feel safe in saying that the steel wheel under 100,000 lb. capacity freight car service will show a saving to the user of 5 to 10 per cent. without taking into account the additional service which a customer will have in the use of his cars, their increased carrying capacity and the added safety.

The advantages of the steel wheel, for freight car service especially, have just begun to be realized, and it is safe to assume that their great safety and long life will cause a remarkable change in the equipment of railroads in the next few years. The enormous trackage required for terminal yards and the difficulty of purchasing more land has made all railroad people study a solution of this problem, and the natural solution seems to be the use of fewer cars with larger capacity, and the first step has been to construct cars with a 70-ton capacity. In fact, some roads have gone so far as to construct for special service cars of 100-ton capacity. Both of these types require steel wheels, and with the general recognition of the necessity for these high capacity cars, the universal use of steel wheels is a foregone conclusion.

Discussion

By D. F. Crawford, general superintendent of motive power, Pennsylvania Lines West, Pittsburgh.

The development of the wrought steel wheel has been of interest to the management of the railways from two viewpoints, viz.:

1. Its use as a substitute for the steel tired built-up wheel of various patterns used for passenger equipment cars and locomotive tenders.

2. Their application to freight carrying cars, especially those designed for mineral traffic, instead of the cast-iron wheel generally used.

Even in the early stages of the development it was apparent that the wrought steel wheels could be produced at prices which would warrant their introduction in lieu of the steel tired wheel, and consequently a considerable number of them are now in service under passenger cars and the heavier locomotive tenders.

The results obtained with the wrought steel wheels in such service indicate equal safety, with decreased investment and maintenance cost, as compared with those formerly used. While wrought steel wheels are now used in large numbers for freight carrying cars, the length of time in such service has not been sufficient to give really conclusive information as to the relative economy of the wrought steel and cast-iron wheels, especially the cast-iron wheels of the recently strengthened designs and made under improved methods of manufacture. The data available, however, indicate that in the wrought steel wheel at the present prices the cast-iron wheel has at least found a competitor, and that a further reduction in the price of the steel wheel will probably lead to their more extended use for freight car purposes.

The Performance of Cast-Iron Wheels

Quite a number of the freight cars of 100,000 lb. capacity, built immediately after their advent in 1898, were provided with cast-iron wheels of the lighter designs, and as practically all the cars of the capacity named, built in the earlier years, were for mineral traffic, the combination of light wheels and heavy work resulted in more frequent failure and rapid wear than was desirable. Notwithstanding the fact that the weight of the cast-iron wheel has been increased from time to time, it cannot be said that cast-iron wheels in general use today give as good results for cars of 100,000 lb. capacity as was obtained with similar wheels for cars of 60,000 lb. capacity.

The above mentioned conditions, coupled with the construction of cars having capacities as high as 140,000 lb. carried on eight wheels, without doubt extended the use of the steel wheel and stimulated their production.

As an indication of what service may be expected from the steel wheel, the fact that records of the mileage of a number of wheels under 100,000 lb. capacity cars in freight service, show that an average of about 180,000 miles per wheel has been obtained without reaching a condition requiring turning. This mileage represents from 18 to 22 years of service under the average freight car.

Accurate information regarding the mileage of cast-iron wheels under cars of 100,000 lb. capacity is, unfortunately, not available, but from records made in 1907 it was found that the average age of a number of wheels removed from service, from cars of 100,000 lb. capacity, was 4 years, corresponding to a mileage of from 32,000 to 40,000 per wheel.

As there can be no question as to the relative strength of an equal section of wrought steel and cast-iron, it would seem that for cars of 100,000 lb. capacity and over the steel wheel must have preference from this viewpoint.

The Pennsylvania Railroad System has followed with interest the development of the wrought steel wheel practically from its inception and has made use of them in considerable numbers during the entire period of its development, and at the present time they are used exclusively for

Locomotive tenders—Passenger service.

Locomotive tenders—Freight service (over 5,000 gal. capacity).

Passenger equipment cars (where the weight per wheel exceeds 10,000 lb.)

Freight equipment cars (gondola and hopper cars of 100,000 lb. capacity and greater, for mineral and mill traffic).

The lighter tenders, passenger cars and freight cars of less than 100,000 lb. capacity, as well as the box, refriger-

ator and stock cars of 100,000 lb. capacity, are provided with the cast-iron wheels. Up to the present time about 325,000 wrought steel wheels have been purchased and the results obtained indicate the desirability of continuing the practice referred to.

The Record of the Solid Steel Wheels

Of the total number of 325,000 wrought steel wheels purchased, but 328, or about one-tenth of one per cent., have been withdrawn from service on account of breakage or cracks. Of these defects 164 were located in the tread, 69 in the plate, 50 in the plate and hub, and but 45 in the flange. The small number of defects located in the flange is particularly interesting, as it is at this point that the cast-iron wheel of the design in general use has the least strength. The majority of the 328 wheels referred to were used under heavy locomotive tenders, and is, therefore, representative of the effect of the hardest kind of service.

As these defects are those which occurred during the entire period of development of the steel wheel, and the number includes many manufactured under the less perfected processes at first employed, it is to be expected that even a more favorable record will be obtained in the future. In fact the processes now in use should practically eliminate the tread defects, as the larger portion of such defects were undoubtedly due to the effects of pipes in the original ingots.

The defects in the plate and plate and hub are probably due to shrinkage strains, and their number clearly shows the desirability of further study as to the cause and means for their elimination. Quite a large number of the wheels as at first manufactured gave short service life on account of lamination of the treads (the same defect as was frequently found in steel tires of the smaller diameters), but with the wheels as now made the number having laminated treads is comparatively small.

On the application of steel wheels to mineral carrying cars it is the practice of the Pennsylvania System to increase the nominal carrying capacity from 100,000 lb. to 110,000 lb., thus increasing the permissible lading from 10,000 lb. to 12,000 lb. As there is no doubt of the wheel having ample strength to permit obtaining the full capacity of the axles, this increase in capacity not only adds to the earnings obtained with the vehicle, but assists in keeping them always provided with a full set of steel wheels, as this kind of wheel only is the standard for cars of over 100,000 lb. marked capacity. The construction of many freight carrying cars of over 100,000 lb. capacity still further broadens the field for the use of the steel wheel, and makes necessary the further strengthening of the cast-iron wheels on the lines already indicated by the manufacturers.

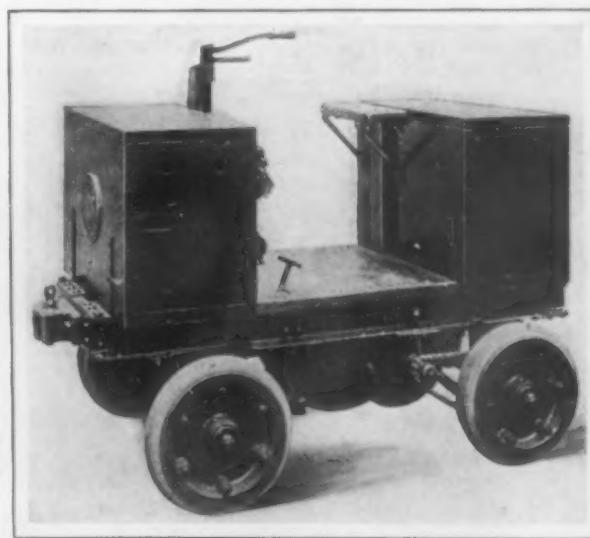
Sun-Power Plant in Egypt

Consul Arthur Garrels, Alexandria, furnishes the Daily Consular and Trade Reports the following information: A public demonstration was given July 11, 1913, of the workings of the sun-power plant recently erected at Meadi, near Cairo in Egypt. The principle involved in the plant is the invention of Frank Shuman, an American, who supervised the erection of the plant and is conducting the experiments. The plant covers several acres on the west bank of the Nile. A series of reflectors and absorbers, a low-pressure steam engine, a condenser, and a pump comprise the principal independent units of the mechanism. There are five reflectors, each of which is 204 ft. long and parabolic in form. They are spaced at intervals of 20 ft. and made up of a series of $\frac{1}{8}$ -in. glass mirrors. The reflectors aggregate a total light absorptive surface of 13,500 sq. ft., are placed in iron frames, and geared and interconnected with the engine by an arrangement of cog-wheels. The mirrors automatically follow the course of the sun and are regulated by a thermostat, the secret of the invention. Running down the center of each reflector is the boiler or absorber, a box of $\frac{3}{8}$ -in. metal with a tube at the top. By means of an automatic feed the box is constantly half full of water. The reflected sun rays are concentrated on these boilers, and the steam generated is led from the various units to the engine. The 100-hp engine is of the low-pressure type. The exhaust is condensed to water and returned to the boilers.

New Storage Battery Trucks and Tractors

A new line of storage battery trucks and tractors designed for handling material in manufacturing plants and freight at warehouses and railway terminals has been brought out by the Atlas Car & Mfg. Company, Cleveland, Ohio. In construction the general features of each are largely similar. The tractor has two storage battery boxes, one located at each end of the platform. The battery of the truck is located in one box at the forward end of the platform. Both types are substantially built, being designed to give the maximum wear and service with a minimum cost of upkeep. The platform is supported on a heavy steel frame. The wheels are of steel equipped with roller bearings and solid rubber tires. The platform is mounted on coil springs, which permits the handling of fragile material with the minimum breakage. The axles are of forged steel. The motor and steering head have ball bearings. The power is transmitted from the motor to the wheels by differential gears, allowing the wheels to turn independently in rounding curves. Control levers are in easy reach of the operator. The vehicles can be turned in a short space, can be run either forward or backward, and as their operation is simple they can be placed in charge of unskilled labor.

Both the truck and tractor are 3 ft. 2 in. wide and 3 ft. 6 $\frac{1}{2}$ in. high overall. The truck is 8 ft. long. Its loading platform is 1 ft. 8 $\frac{1}{4}$ in. high, 5 ft. 3 in. long and 3 ft.



One of a New Line of Storage Battery Trucks and Tractors Designed for the Haulage of Material in Industrial Plants

wide. It weighs 2100 lb. The tractor is 5 ft. 8 $\frac{1}{2}$ in. long and has wheels 16 in. in diameter. Its weight is 2000 lb. The capacity of the truck is 3000 lb. The tractor has a drawbar pull of 300 lb. and it is stated that it will haul loads up to 10 tons on ordinary smooth solid floors.

The tractor and truck have 24 cells of lead battery requiring 65 volts direct current for charging. The time required for charging varies from 5 to 10 hr. The cost per ton-mile for current is stated to be about $\frac{3}{4}$ c. based on electricity at 7c. per kw.-hr. One charge of the battery is said to be sufficient to operate the tractor hauling trailers throughout a working day of 10 hr. It is stated that one charge of the truck battery is sufficient for hauling a 3000-lb. load a distance of 65 miles on a level floor.

An interesting coal handling belt conveyor has been put in service by the Northeastern Railway Company at Middlesbrough, England. A belt conveyor 42 in. broad and 310 ft. long, which travels up a long incline at an angle of approximately 20 deg., is fed from a 30-ton hopper under the railroad track. It delivers to a counterbalanced loading jib which has a lateral as well as vertical swing to reach the hatches of a ship. The jib has an endless belt of steel plates, which extends its entire length, 54 ft.

The Bridgeport Testing Laboratory, Bridgeport, Conn., announces that, to accommodate its rapidly growing business, it has moved to 388 John street, where it will occupy the entire building.

A New Flat Turret Geared Head Lathe

A Tool for Bar and Chucking Work Equipped with a Single Pulley Drive

A combination flat turret lathe with a single pulley drive and geared head has been placed on the market by the Acme Machine Tool Company, Cincinnati, Ohio. It is adaptable to both bar and chucking work, the maximum capacity for the former being pieces $3\frac{1}{4}$ in. in diameter and 36 in. long, while the maximum diameter of chucking work which can be machined is 16 in. The actual swing over the bed is 22 in.

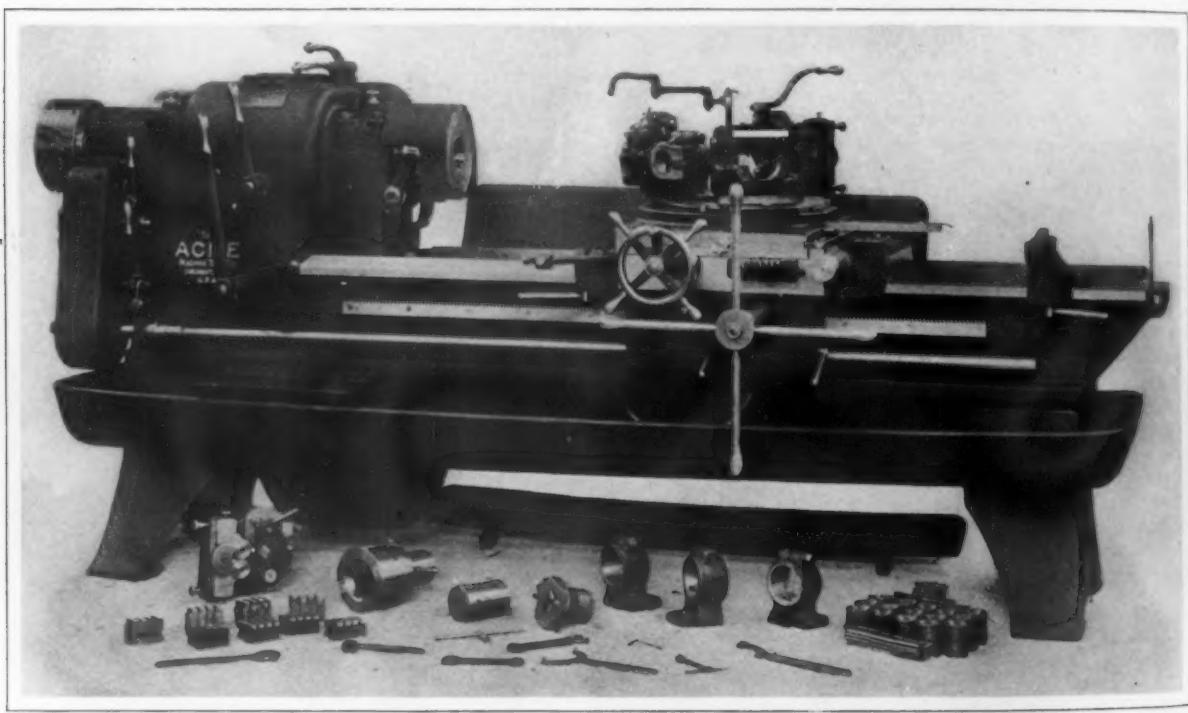
A heavy, deep box section casting reinforced by ribbing is employed for the bed which rests on a three-point bearing. The pan is made very deep to provide for a large quantity of chips and the pan blocks and tank are cast solidly with it. A geared pump provides a supply of oil when the machine is running in either direction and there is a perforated cover which serves as a strainer to permit the oil to drain back into the tank and be used over and over again.

Nine different speeds ranging from 14 to 285 r.p.m. are obtained through gears running in an oil bath in the geared head. These changes are obtained quickly and noiselessly by the manipulation of two conveniently located levers at the front of the head. The head is cast solid with the bed, which, it is emphasized, gives

the turret down. The cross slide moves on a long, narrow dove-tail guide with wide flat bearing surfaces on either side and has an adjustable taper gib to compensate for wear. There is also a hardened, adjustable center stop provided for the slide.

Hand and power cross feeds are provided in both directions and there is a large, graduated pilot handwheel for use in forming operations. The feeds for both the longitudinal and cross movements are of the geared type and all changes are instantly obtained by the lower lever on the front of the headstock and can be reversed through the upper one, all changes in rate or direction being secured without stopping the machine. There are 12 longitudinal stops provided, one independent stop for each turret face and six auxiliary ones which can be used in any desired combination with the independent stops and are operated by the knob on the front of the saddle. There are eight stops, which are controlled by the knob on the front of the slide, provided for the cross feed. These can be used in conjunction with the large graduated pilot wheel and all stops are arranged to trip the power feed in either direction. When chuck work is being handled, it is possible to turn seven different lengths without indexing the turret.

The automatic chuck used is designed to insure accurate holding of the work and give great gripping power. The long lever at the front of the head enables it to be opened and closed while the machine is running.



A Recently Developed $3\frac{1}{4}$ x 36 in. Flat Turret Geared Head Lathe with Single Pulley Drive Equipped for Handling Bar Stock Work

a constant alignment of the spindle with the V's upon which the turret carriage travels. A high carbon, hammered, crucible steel forging is used for the spindle, which is mounted in renewable babbitt bearings. A double cone friction, which is operated by a lever at the front of the head, provides a means for starting, stopping and reversing the spindle instantly.

The apron is of the standard double wall construction which provides a support for all the shafts and studs at both ends. It is bolted and keyed to the bottom of the saddle and gives a double bearing support for the feed rod which is driven by a knuckle joint coupling at the head end. The saddle has a continuous bearing on two heavy V's on the bed and carries an adjustable swinging stock stop, which is attached to the front.

The cross sliding turret revolves on a hardened and ground large diameter stem and is locked in position automatically by a hardened and ground tool steel taper plunger, placed directly beneath the cutting tool. This plunger works in hardened and ground taper bushings let into the solid turret and circular clamps at the extreme outer edge provide a further means for holding

Emphasis is laid upon the fact that while the chuck is being closed the work does not have any end movement. The master collet parts that hold the jaws are kept tight against the closing ring, which is relied upon to prevent dirt and chips from getting between them. The jaws do not collapse and it is possible to hold very short work without tilting. An adjustment for $1/16$ in. larger or smaller is provided to take care of variations in diameters. The jaws, which are hardened but not ground unless specially ordered, can be readily removed without dismantling the chuck and all of the working parts are hardened and ground. Emphasis is laid upon the fact that only one adjustment is necessary to enable the roller feed to handle stock of varying sizes. When the jaws have been adjusted to the size of the stock being handled by a spanner wrench, they are slightly released and the rollers will have the proper tension. The same lever that actuates the automatic chuck also operates the roller feed.

The lathe is driven by a $3\frac{1}{2}$ -in. belt, running over a 12-in. single pulley, operating at a constant speed of 600 r.p.m.

A Recent Cold Metal Cutting-Off Saw

A cold metal sawing machine which employs a sprocket drive and has centralized control and an interesting type of feed mechanism has been placed on the market by the Lea Equipment Company, Philadelphia, Pa. The machine is built in a number of different sizes for either belt or motor drive and will cut round stock ranging from 5 to 10½ in. in diameter, as well as corresponding sizes of square stock and I beams.

The frame is a single-piece casting and is reinforced by ribbing. The main drive shaft and the trunnions of the swing arm are carried in three bearings in the frame, the top of which is planed to serve as the work table. The bottom of the frame casting serves as a receptacle or tank for the cutting compound, and at one side there is a pad to which a motor support can be bolted if this form of drive is to be employed and which replaces the bracket carrying the tight and loose pulleys required for belt drive.

The swing arm consists of a strong and rigid casting which is suspended at three points only to relieve the bearings of all side thrusts. This construction is relied upon to have the blade revolve at all times in a



A Cold Metal Cutting-Off Saw for Either Belt or Motor Drive Equipped with a Special Type of Feed Mechanism

vertical plane. At one end of the swing arms there are two trunnions which rest in bearings forming part of the frame and the other end is supported at one point only through the teeth of a quadrant that engages the worm for raising and lowering the arm.

The sprocket drive of the saw blade, fastened to the end of a crucible steel spindle, engages radial slots in the blade. At the other end of the spindle is a bevel gear through which the blade is driven from the main shaft. The sprocket has a tapered bore to fit the conical end of the spindle and is keyed in place and clamped with a nut and washer, an arrangement which permits worn out sprockets to be replaced easily. Guide plates, which are calculated to protect the blade from side thrust and buckling at the point where the power is transmitted from the sprocket, are used, and as the radial slots are located close to the periphery of the blade, it is pointed out that it is pulled through the metal with a steady, powerful motion.

The feed mechanism consists of a vertical feed shaft carrying a large worm and two spiral gears with the necessary clutch for feeding and return and a control rod. The worm engages the quadrant fastened to the swing arm, moving it up or down to feed or return the saw blade. The direction in which the worm is driven is controlled by the position of the clutch which engages

either the lower gears for feeding the saw upward into the work and the upper set for returning it. The control rod is moved up or down manually by a lever which throws the handle on its upper end or automatically by an adjustable dog and tripping device. By moving the handle, the blade is either fed upward, downward or not at all. The automatic control is operated through a lug on the swing arm casting when it comes into contact with an adjustable dog on the control rod, the position of the dog being adjusted to suit the length of feed necessary to complete the cutting of the work in hand. When the lug and dog come in contact a tripping device located on the bottom of the control rod is released, which either returns the blade automatically or throws the feed out altogether, as may be desired by the operator.

The feed regulating mechanism is contained in a separate box at the front of the machine, close to the operator. It consists of a lower and an upper shaft controlling the feed and the return respectively and a set of friction disks with an indicator. The power required to feed the saw blade is transmitted from the main driving shaft to the upper shaft by sprockets and a heavy roller chain, passing from the upper shaft to the lower one through four friction disks. The regulation of the feed is obtained by turning the ball crank on the top of the box which changes the relative position of the disks. A graduated indicator rod in plain sight of the operator on the top of the box shows the exact feed per minute. The knob on the end of the horizontal shaft, which is not shown, enables the friction between the disks to be regulated to obtain a positive feed, if desired.

Lead Coating on Iron and Steel

The Sherard Cowper-Coles process, it is stated by the London Iron and Coal Trades Review, permits of the economical deposition of lead up to a thickness of $\frac{1}{6}$ in. A plant has been erected in London for the coating of sash bars for window frames and for metallic glazing for roofs. The process also enables brass, copper and other metals to be coated with lead. Steel sheets coated with lead by this process are much smoother than the ordinary terne plate, and there is no reduction in tensile strength or ductility. The process can also be applied to the coating of earthenware and wood, and the protection of ornamental iron work. For an equal weight of metal, it is stated to be cheaper than hot galvanizing. The following is given as the cost of depositing lead in varying thicknesses up to $\frac{6}{100}$ in., the cost of electric current being taken at 1d. per kw.-hour and of lead at £22 per ton:

Thickness. Inch	Weight of lead, oz. per super foot. oz.	Cost of lead per super foot. d.	Cost of electricity per super foot. d.	Total cost per super foot for lead and electric current. d.
.001	0.949	.139	.0069	.146
.005	4.745	.696	.035	.731
.010	9.490	1.392	.069	1.461
.015	14.235	2.088	.104	2.192
.020	18.980	2.784	.138	2.922
.025	23.725	3.480	.173	3.653
.030	28.470	4.176	.207	4.383
.035	33.215	4.870	.241	5.112
.040	37.960	5.568	.276	5.844
.045	42.705	6.270	.311	6.581
.050	47.450	6.960	.345	7.350
.055	52.195	7.655	.374	8.070
.060	56.940	8.352	.414	8.766

Increase in Venezuelan Iron Ore Shipments

The output of the Canadian Venezuelan Ore Company has been doubled, or from about 400 tons a day in the early summer up to 700 or 800 tons a day. An increase to 1000 tons per day is expected soon. The company now has seven vessels under charter conveying the ore to Philadelphia. Shipments in October were expected to reach about 16,000 tons.

It is stated that the United Fruit Company has made arrangements with the government of Honduras by which the Trujillo railroad is to be extended, furnishing an outlet for the deposits of iron ore near Agalteca and Comayagua. These deposits are described as being an overthrow of a large hill, and German engineers have estimated that there are 300,000,000 tons of ore in sight.

Present Day Need of Vocational Education*

Social and Industrial Changes Have Created a Serious Problem for Manufacturers—Business Concentration an Economic Necessity

BY THEODORE W. ROBINSON†

In the development of civilization the result of all change has been for ultimate progress. The world has grown better, but change has often meant temporary retrogression, in times past even to the destruction of the highest exponents of civilization. We are now in a period of marked transition. History records no other such wonderful development as that of the United States. No people has ever been so well fed, so well housed, or has enjoyed such high social standards. No other era is comparable with ours in the production of wealth and no country has seen such a rapid accumulation of riches. Yet our institutions and our methods, by which so much has been accomplished, are being questioned and attacked. Public opinion is demanding a new social order. Insistence upon change is deep-seated and extends much farther than mere political expediency. Change, it is true, is the law of human nature, but why the present widespread unrest? What are its manifestations, its causes, its remedy? These are matters of concern that are pressing upon us. We have been rapidly making history of late, and this nation, whose birth in the family of nations is as of yesterday, is still an experiment in self-government.

Changes of a Generation

Our population to-day is three times what it was 50 years ago, and in that period our wealth has increased nine-fold. There has been unprecedented industrial expansion. The cost of the necessities of life has largely increased. The growth of our farms has not kept pace with the growth of our cities. Our standards of life have been wonderfully altered. Our food products of late have relatively and actually decreased in quantity but have enormously increased in value. Aggregation of capital has reached unparalleled proportions; and our labor, with shorter working hours, is receiving higher wages than ever before. These are some of the changes of a generation. But in our public schools, the very basis of our modern civilization, there has been relatively little change. It would be hackneyed to say that our greatest institution is our public schools were it not that ignorance on the one hand and indifference on the other cause that fact to be too often forgotten.

Our most important industry is the dissemination of knowledge to our youth; and whether the intelligence of American manhood and womanhood is to be high or low, whether efficiency on the farm and in the factory is to be increased or decreased, depends directly upon the strength of our educational system. The character of a nation is the composite character of the individuals making up that nation, just as the wealth of a nation is the aggregate of the wealth of its individual inhabitants. Anything, therefore, that makes for the moral and mental elevation and the increased efficiency of our people makes for the moral and industrial superiority of our country. Only by combining a high type of citizenship with material welfare may we hope to command the contentment that makes for orderly progress, and only by proper education may we expect to insure these essentials. What, then, is our educational system, what is its strength, wherein lies its weakness?

The American School System

The school system of the United States consists essentially of a kindergarten period, usually of two years, eight grades of elementary school with a period of eight years, a high school period of four years and a college or professional school period of four years. Graduation from the high school admits to the academic colleges and to most of the schools of law, medicine, engineering, agriculture, architecture, dentistry and pharmacy, whether

in state-supported universities or in privately endowed institutions, such as Harvard and Yale. Under most of our State laws education is compulsory from the age of six to fourteen years inclusive. Nevertheless, of our population of ten years of age or over there were, according to our last census, five and a half millions who were illiterate. The number of pupils enrolled in our public and private schools and colleges in 1910, not including special educational institutions, aggregated over twenty millions, or 21.3 per cent. of our total population. Our public schools represent an investment of \$1,250,000,000, and it costs \$450,000,000 a year to operate them.

For the promotion of intellectual culture and for professional training, our educational system is unexcelled. Our grade schools and our high schools afford a satisfactory preparation for higher education; but higher education is for the few. Of all persons under process of education in 1910, 92.36 per cent. were in our elementary grades, 5.98 per cent. in our high schools and other secondary institutions of learning, and only 1.66 per cent. in our universities, colleges and professional schools. This terrific educational mortality is emphasized by the fact that 80 per cent. of all our children leaves school at fourteen years of age or earlier. These figures plainly prove that the education of the vast majority of our boys and girls is confined to the elementary school where, with but few exceptions, they find little that is applicable to their life's work beyond a primary training in reading, writing and arithmetic.

The Need of Vocational Schools

A generation ago our schools were much better adapted to meet the requirements of the community than they are at the present day. While then as now the grammar school led to the college or professional career through the high school or academy, and elementary training was largely based on the cultural needs of those destined for higher education, the conditions and the environment were nevertheless quite different. Life was then comparatively a rural existence. Specialization of labor and the modern demands of industry were largely unknown. The apprenticeship system, now largely obsolete, afforded a satisfactory opening to an industrial career, and the office was an efficient threshold to a commercial future. The demands of industry were early responsible for the establishment of the scientific school, and such institutions as the Massachusetts Institute of Technology, Van Rensselaer, Stevens and others of a similar type are institutions of higher education. Later the manual training school was inaugurated, and while much was anticipated from the innovation it has proved of little value beyond its cultural worth.

As the importance of readjusting our educational methods became more apparent, the necessity of a vocational training that should provide practical instruction in agriculture, commerce, industry and the art of home-making became better appreciated. The National Society for the Promotion of Industrial Education has conducted an active and effective propaganda. The American Federation of Labor and the National Society of Manufacturers have investigated and endorsed the movement. There is legislation pending before Congress providing for national grants of money to States which shall establish vocational schools. Legislation has been enacted in Massachusetts, Wisconsin, Indiana and several other States. Some work has been done by private initiative, and E. G. Cooley's report on Vocational Education in Europe, compiled and published under the auspices of the Commercial Club of Chicago is one of the most valued contributions on the subject.

The general plan of vocational education is to add schools to our public school system which shall be designed with a special view of meeting the occupational needs of

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the community in which they may be located. As is the case with the high school, they should be supplementary to the present grade schools. They should be open to both sexes and should provide instruction both to those who could devote their time to continuous study and to those who, while at work, could devote a few hours a week to special courses. Part time attendance should be compulsory for all children under 16 or 18 years of age who are not in other forms of school.

What Germany Is Doing

There is perhaps no greater object lesson of the possibilities of vocational training than the phenomenal industrial advance of Germany during the last generation. With but 7 per cent. of our land area, and with a population 30 per cent. smaller than our own, Germany's imports and exports of merchandise in 1910 not only exceeded those of the United States, but surpassed those of all the other nations of the world excepting only the United Kingdom. This has been accomplished primarily because 40 years ago German statesmen were sufficiently farsighted and progressive to inaugurate the comprehensive system of vocational education by which the German youth acquire a better training for their life's work than the youth of any other nation. In Germany to-day education is a public duty in which both statesmen and men of affairs actively concern themselves. Put interest in vocational education is by no means confined to Germany. England, Scotland, France, Austria, Switzerland, Norway, Sweden and Denmark have all made rapid strides toward remodeling their educational methods and facilities. Perhaps Scotland and Switzerland, after Germany, have done the most effective work in this regard, and in England a great impetus has been given to the movement by the personal interest evinced by Lord Haldane, Lord Chancellor of Great Britain.

The United States Backward in Vocational Education

The United States, of all great nations, is the most deficient in caring for the vocational education of its people. Our great educational problem is how to extend the education of the 90 per cent. of the children who are in the grade schools and how best to provide for them a training for civic and industrial intelligence. This is a fundamental question deeply involving our national life.

Fifty years ago we were torn by a struggle of sectional differences. We now have entered on a struggle of factional differences which the ballot must decide. The problems that followed our civil war were pre-eminently economic problems directly or indirectly dealing with the development of our natural resources. The development of our agricultural and mineral lands, the opening of waterways, the building of railroads, the replacement of manual by machine labor, the extension of the factory system, were all developments of farm, transportation and manufacture involved in the production of wealth. Our important problems to-day, however, are largely questions of supervision and regulation, and the division of industrial reward rather than the promotion of industry itself. They are still economic questions, but they deal with the distribution of wealth rather than with the production of wealth. People are discontented not so much because there is a lack of opportunity for individual effort, as because the natural tendency to question the division of the product of industry is being aggravated by the increased cost of living. Example is a force that goes far toward inducing poverty to vie with opulence. Because no people of any land have ever enjoyed such prosperity as we enjoy reduces but little the contrast between those of modest circumstances and those of superlative fortune.

Fortunately, we have no such vested rights as exist in some of the older countries to help temper public sentiment by traditional class distinction. We have our classes of society—and there always will be classes with lines of demarcation more or less indefinite—but we have no class into which any one of our citizens may not enter provided he possess the necessary intelligence and economic qualifications. From dependence to self-support, from poverty to riches, are steps to which we in this country put up no legal or social barrier.

Immigration as a Factor

A grave and increasing responsibility is placed upon our educational system by the large immigration we are receiving from foreign countries. An analysis of our popu-

lation shows that it is approximately made up of 89 per cent. of the white and 11 per cent. of the negro races, and that only 54 per cent. of our whole population is of native parentage. During the last ten years there has been an average yearly influx of nearly a million aliens. These people represent a most valuable asset in our material growth, but in their proper amalgamation lies that great question of citizenship upon which the future of this country so largely depends. These embryonic citizens are not, as formerly, representatives of the hardy Anglo-Saxon races of the North. It is the Poles, the Slavs and the Latin people with whom we now have to deal. While they are capable of high character and efficiency, the problem of education and amalgamation in their case is fraught with greater difficulty than if they were racially more closely allied to our ancestry.

The sentiment of a people is more or less reflected by their political affiliations and activities. For a generation we have had two dominant political parties in this country. Over night, as it were, a third party sprang into existence and over four millions of our citizens followed its standard. It is not pertinent to discuss here what may or may not have caused such an unusual political departure or whether the principles enunciated by the new party are new or old, desirable or undesirable. The fact is given as evidence that there is an extensive desire for change which neither the influence of personal magnetism nor the possible dereliction of party duty can explain.

Socialism

Further evidence is found in the rapid growth of socialism. In 1912 the Socialist party polled in this country more than twice as many votes as it did in 1908. Twenty years ago the Socialist party cast 21,000 votes. Last year it polled nearly 900,000 votes. The growth and purpose of socialism abroad is largely due to conditions peculiar to the old world. The purpose of socialism in this country is recorded in its late party platform which ends as follows: "Such measures of relief as we may be able to force from capitalism are but a preparation of the workers to seize the whole power of government, in order that they may thereby lay hold of the whole system of socialized industry and thus come to their rightful inheritance."

The menace of socialism can be minimized by a vocational training which will increase the intelligence and future earning power of our children. It is not difficult to inculcate the fundamental principles of industrial economics in an elementary way, and it does not require a mature mind to comprehend that the source of all wealth is the soil, that wealth can only be produced by the joint effort of capital and labor, that there always will be differences in individual character and ability, and that no social plan can be maintained which goes contrary to these basic truths.

Social and Industrial Changes

If public opinion is to be directed through constructive channels, it must be in part by promoting a wider knowledge of the economic and industrial changes that have been taking place and by commanding a better appreciation of their influence upon society. In the last few years there has been a striking change in our rural and urban population. From 1900 to 1910 the population of the United States increased 21 per cent. During this period the rural communities gained 11.2 per cent. and the urban 34.8 per cent. As an economic and social necessity, it behoves us to increase wherever possible the interest of our people in our farms. How much we have relatively fallen behind in our agricultural life is partly shown by the fact that we should now have 2,500,000 more people engaged in farming had the number that were so engaged 30 years ago been proportionately maintained. While from 1900 to 1910 our population increased 21 per cent., during the same period the number of our farms increased but 10.9 per cent., our total farm acreage increased 4.8 per cent., and the increase of our crop production was in volume only 10 per cent. In the last five years the number of sheep in this country has actually decreased more than 3,000,000 and the number of cattle has decreased more than 15,000,000. As a natural sequence, the value of our food products and the value of our farm lands have greatly increased.

Much of the soil of Europe which has been under cultivation for centuries is producing by methods of intensive

farming more than double the amount that our comparatively virgin soil is producing. For the period 1903 to 1912 the average yield of wheat per acre in the United States was 14.1 bushels as compared with 30.1 bushels in Germany and 31.7 bushels in the United Kingdom.

These facts have an important bearing upon the necessity of providing vocational schools in the agricultural districts which shall be supplemental to the present country schools and which shall be equipped for practical instruction in such elements of scientific farming as fertilization, rotation of crops, drainage and breeding. If we are to extend our rapidly approaching limit of agricultural home maintenance, we must dignify agricultural labor and make it more productive.

Our Foreign Commerce

The social character of a community has always been profoundly influenced by the degree of its material prosperity. The prosperity of this country is bound to be influenced to an accelerated degree by the extent of its foreign commerce. The share which manufactures form in our exports and which manufactured materials form in our imports has largely increased during recent years. The total value of our exported manufactures increased in round figures from \$122,000,000 in 1880 to \$1,020,000,000 in 1912. On the other hand, the total value of foodstuffs exported in 1912, amounting to \$419,000,000, was actually \$41,000,000 less than the value of foodstuffs exported in 1880. Perhaps more impressive are the figures showing the change in percentage which foodstuffs and manufactures respectively bear to our total exports. From 1880 to 1912 our foodstuffs fell from 55.77 per cent. of our total exports to 19.29 per cent. In the same period our manufactures increased from 14.78 per cent. of our total exports to 47.02 per cent.

This great change in the character of our export trade reflects our rapidly changing industrial conditions. If we are to continue to compete successfully in the markets of the world and still maintain the American standard of wages in the face of the low wages of foreign countries, we shall not only need a comprehensive system of industrial education but shall also require the economies which are possible only through the concentration of business. How much the latter has already influenced our foreign trade is partly exemplified by the increase in our exports of iron and steel. In 1890 the value of our iron and steel exports was \$25,000,000; in 1912 their value was over \$250,000,000.

Business Concentration an Economic Necessity

But concentration of business is being attacked as monopolistic. Those who fear the danger of monopoly should remember that business concentration is an important factor in modern industrial development, and that monopoly is but a preventable perversion of its great power for social progress. Between the evils of monopoly on one hand and the waste of unrestricted competition on the other, there is a zone for concentration and co-operation that should be within the law. Concentration of business through large corporations, with its resulting increase in efficiency and the elimination of waste, is an economic necessity which can no more be successfully replaced by small units of activity than can the power loom of the factory be successfully replaced by the hand loom of the home.

If we are to build up our commerce properly, we must better develop our latent industrial possibilities. There are to-day hundreds of thousands of children between 14 and 16 years of age, who for want of proper educational incentive and opportunity are either idle or without fixed employment. A system of education which would provide these children in our commercial and industrial centers with an opportunity for instruction in drawing, accounting, dressmaking, millinery, stenography and trade activities would go far toward decreasing the number of our social derelicts.

High Cost of Living

The method of living of our so-called plain people is on a much higher plane than has existed in any other nation or in this country at any other time. We properly have been concerned of late with the rapid increase in the cost of living. The movement is world-wide, but per-

haps its influence upon existing social conditions is nowhere so strongly emphasized as in this country. Although the results of our high cost of living are largely social in their effect, the causes are principally economic in their character.

That the high cost of living is due to the cost of high living is an aphorism that represents but a partial truth. Our people, it is true, live on a much more extravagant scale than ever before; but it is also true that food, raiment and habitation cost much more than heretofore. Any intelligent discussion, therefore, of the reasons leading to the increased cost of our manner of living must take into consideration two factors: first, the increased cost of necessities; second, the increased cost of luxuries. It is obvious that the causes leading to the increased cost of our necessities are many and complex. There are, however, two basic causes for their increased cost:

1. The decrease in the number of men engaged in producing our necessities from the soil in proportion to our total inhabitants.

2. The cumulative effect of increased wages throughout the country.

With equal efficiency, no standard of living made possible by the wealth produced by ten hours of labor in the factory or on the farm could be maintained with fewer hours, unless wages or the value of the product be increased. As a nation we are proportionately working fewer hours than ever before, and we have a greater number of the inefficient and the idle in our midst. Between 1900 and 1910 the average price of land increased from \$15.57 per acre to \$34.40 per acre. The result of proportionately fewer men working shorter hours with more valuable land has been an increased cost for which labor-saving devices have not compensated. These are the underlying economic conditions which through the natural law of supply and demand are responsible for the increased cost of the necessities of life.

The other and perhaps more influential factor in our high cost of living is the increased cost of luxury. The demand for luxury is a manifestation of prosperity and is bred from an innate desire for comfort, power and prestige. It is both material and psychological in its character, and is an ever-expanding force in our modern civilization with which the sociologist and the economist must frankly deal. It has put a strain upon our whole social and industrial fabric that would have been deemed impossible a generation ago. Can any one rightfully question the vital bearing that education has on these matters or doubt the necessity of obtaining greater agricultural and industrial power through a comprehensive system of vocational training?

More Spent for Automobiles than Public Schools

The nation's welfare can be maintained only by increasing the productiveness of its labor and by judiciously directing it in reproductive channels. Labor expended in the fields or in the manufacture, transportation or distribution of the necessities of life is reproductive. But labor expended in the production of luxuries is principally lost in an economic sense.

Our latest large industry, the manufacture of the automobile, is more or less illustrative of this point. According to an investigation made by the Automobile (magazine), there were in this country at the beginning of 1913 over 1,000,000 registered machines, less than 55,000 of which were commercial cars. Last year we produced 378,261 cars, with a sale value of \$542,500,000. On the basis of the average value of last year's output, the value of all the cars registered in this country would be approximately \$1,500,000,000. If we assume that \$500 per car per year approximately represents the cost for maintenance and operation, it appears that it costs \$500,000,000 annually to operate these machines. This is more money than is spent each year in operating the entire public school system of the United States. These figures are startling, especially when we learn that only 6 per cent. of all these cars is for industrial use, and 94 per cent. is essentially devoted to purposes of recreation.

In the development of the commercial car, however, the automobile industry is destined to be the source of great reproductive activity, and hence an important agent in the future production of wealth, although its result thus far is largely represented by the opportunity it affords for luxurious recreation. Reasonable recreation and rea-

onable luxury are essential for the best ethical development; but the price has to be paid, and the bill is found in our high cost of living.

A Serious Industrial Problem

It is evident that we are passing through momentous changes. The decline of agriculture and the growth of industrialism, the increased cost of living and the change in our methods of living are some of the causes that have produced the present widespread demand for a new social order. We are facing many serious economic and industrial problems, the proper solution of which is important to the capitalist and vital to the wage-earner. If we are to have orderly progress, we must command a high standard of national character and intelligence, and this means a better and more universal education.

The educational problem that faces this country to-day is not primarily a school teacher's problem. Rather does it demand the initiative and co-operation of the earnest, intelligent layman. If our schools are to be truly democratic, if the needs of our modern life are to be properly reflected in the education of our boys and girls, our men of business and our men of labor must more thoroughly recognize their educational obligations.

Vocational education is not passing social expedient, but one of our most far-reaching national questions. It means not only greater industrial efficiency but also increased economic truth, morality and civic duty. It is not a question for coming generations alone. Every year more than a million of our youths attain their majority, and the children of fourteen years, with whom we are especially concerned, will within seven years come into their political rights. Our nation is one of political freedom and very rapidly our people are coming to better appreciate the extent of their sovereign power. Let us remember that what our laws and institutions shall be must depend upon the will of the people, and this will depend largely upon the character of their education.

Employers' Responsibility

You, gentlemen of the Iron and Steel Institute, are essentially interested in the industrial questions of this country, but back of our industrial questions lie our political, ethical and social questions; and underlying all, and greater than all, are our educational questions. If you believe that we are in the midst of a far-reaching change; if you believe that this transition is fraught with grave importance to you, your children and your institutions; if you believe that only by sane thinking, sober judgment and trained intelligence can the dangers of ignorance, intemperate speech and class legislation be avoided, then it behooves you to use your influence toward providing better educational facilities for the people. While every true American must have faith in the ultimate satisfactory adjustment of our difficulties, the present situation demands more than optimistic indifference or *laissez-faire* consideration. Once let the business men of this country properly awaken to the needs and possibilities of a school reformation and contribute a portion of the time and money now spent in trying to forestall socialism and vicious legislation, and there will be much less socialism and vicious legislation to fight. In the best interests of both labor and capital, and as a matter of patriotism, civic duty and business sagacity, it should be a privilege for every intelligent man, whether he be rich or poor, to take an active part in improving America's greatest institution, the public school.

Discussion of the Paper

College Graduates and Other Shop Workers Should Be Trained in Continuation Classes

BY STEPHEN W. TENNER*

The statistical information in Mr. Robinson's very scholarly paper indicates a great amount of research work on the part of the author. The paper will be a splendid addition to the annals of the Institute and should receive our unanimous indorsement. What I have to say will be along the line of suggestion rather than discussion.

I pick from Mr. Robinson's excellent paper a statement which when it is printed should appear in upper case type, viz.: "Our most important industry is the dissemina-

nation of knowledge to our youth." And with this should appear with equal emphasis his further statement that "80 per cent. of all our children leave school at 14 years of age or earlier." And again: "The educational problem that faces this country to-day is not primarily a school teacher's problem. Rather it is work for the earnest, intelligent layman to undertake." To his statement concerning the vocational schools in Germany I will add between quotation marks the following epitome of the German plan:

"At ten or twelve every boy must choose, according to his means and aptitudes, between the preparation offered by classical, semi-classical, liberal, technical, commercial or trade schools, or enter a shop with the privilege of going to improvement schools. His life is thus given its permanent direction."

Certain it is that our high schools and colleges do not pay enough attention to the bent, the natural desires, the predilections of the students, compelling them to take instruction in courses that will avail them little or nothing when they enter public or business life.

Changes in American Industry

The advent of big business and corporate management brought to an end the dominating influence of the owner or proprietor which held sway during the days of simple partnerships. The management of a large manufacturing establishment is now vested in a board of directors, headed by a president, and perhaps a chairman of the board, while a large corps of lieutenants complete the organization. Obviously this army of lieutenants holding responsible positions should be very carefully chosen with due regard to their fitness for the particular work assigned them and always having in mind that from their ranks executives and administrators must be recruited. Those in authority have constantly before them the matter of filling vacancies, of choosing foremen, superintendents, department or district managers, etc. What material has the managing officer from which to choose? The reorganization of our educational system with the inauguration of vocational schools will help swell the ranks of eligibles; but in the meantime what is the situation and what can be done to improve the material at hand?

College Men and Specialists

President Lowell, of Harvard University, says in substance that that university is turning out specialists of the highest degree and not administrators, and in one of his books he points out the need of both experts and laymen as follows:

"As scientific and technical knowledge increase, as the relations of life become more complex, there is an ever growing need of men of special training in every department of human activity. Any work, therefore, carried on at the present day without the assistance of experts is certain to be more or less inefficient. But on the other hand, experts acting alone tend to take disproportionate views, and to get more or less out of touch with the common sense of the rest of the world. They are apt to exaggerate the importance of technical questions as compared with others of a more general nature—a tendency which leads either to hobbies or, where the organism is less vigorous, to officialism and red tape. In order, therefore, to produce really good results, and avoid the dangers of inefficiency on the one hand and of bureaucracy on the other, it is necessary to have in any administration a proper combination of experts and men of the world."

Experience has clearly proved beyond peradventure that if college men, inclusive of the highly trained specialists, aspire to positions of authority it is absolutely essential for them to begin their business life at the bottom of the ladder, augmenting their scholastic knowledge with that which is practical. For example, a man may know a lake steamer from stem to stern, from keel to truck; may have a thorough mastery of the laws and rules of navigation and the hydrography of the lakes from Buffalo to Duluth, yet it is utterly impossible for him to obtain even second mate's papers without first having had at least three years' sailing experience, beginning usually in the capacity of deck hand or watchman. The college man for the most part has obtained his education from printer's ink; he has been buried between the covers of a book. He is apt to have a false idea of his superiority; his horizon is contracted, and his grasp of the commercial side is but

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slight. And it should be noted with emphasis that no college can specialize to the refinement of meeting every employer's particular and peculiar wish and requirement, much less can it supply practical experience.

The Main Factor in Manufacturing

The first requisite of ultimate success is ability to handle men, and no university can add to its curriculum the all-important practical study of human nature and the human element, without a mastery of which an executive will not measure up to all that is expected of him. This feature is admirably summed up in a paper from the pen of M. W. Alexander, of the General Electric Company, as follows:

"Only extended experience in practical work in which time and money play leading parts can instill a proper conception of these values. It is natural, therefore, that colleges leave to subsequent practical life the young man's development along these lines. Similarly no amount of the study of political economy at college alone can give the student a true perspective of the relations of employer to employee and of the new economic and sociological phases that prove more and more perplexing in our complicated industrial system; a thorough knowledge and appreciation of these forces, however, are to-day considered essential for those who are called to positions of responsibility in the executive and administrative departments of industrial life."

The University of Cincinnati, which now alternates six months of shop work with six months of class-room instruction, thus giving its graduates four full years of college and four years of practical experience, may have hit upon a happy solution.

Some men are peculiarly fitted for work of a very special nature, but these men are not usually of the type that makes good handlers of men in the mass. If college men were told upon graduation it would be absolutely necessary for them to become freshmen again when entering business life, I fear that the matriculating room of our universities would show a decreased attendance. As has been well said: "The great raw material with which the managers, superintendents and presidents are dealing is man, and this raw material receives not a single hour of study at our universities."

I note some employers seeking college graduates exclude the honor men and others express a preference for those who were obliged to work their way through college. Another does not want them till they have been out of college at least two years, when they will have learned something about life and what the world is. The young man of 17, beginning a business career with perhaps only a common school education, has the advantage of from six to eight years' experience over the college graduate, and it seems to me there is as much necessity for the college man to make good this experience loss as there is for the man lacking in scholastic attainment to obtain a technical training.

The college man, if he has made the proper use of his opportunities, begins his career with a keen, analytical mind, and what is more important, he has mastered or should have mastered language, without which continuity of thought and ability to express thought intelligently are not possible. Therefore he will work faster and rise more quickly than his neighbor who lacks a thorough academic education.

The Boy from the Public School

Knowledge is power, and up to a certain point the college man is in possession of this great power; but the supply of college men who have enriched their scholastic training with practical experience is extremely limited. For the bulk of our superintendents, department managers and executives we must turn to the rank and file; to Mr. Robinson's 90 per cent.; to the boys who began their business career between the ages of 14 and 18, who, while the college men are still at their text books, are storing up a wealth of empiric or incidental education gained from observation and association in the hard school of experience, grappling with the duties and problems of daily life —men who have the quality of stick-to-it-iveness; men who have been thrown in and "roughed it" with their fellow man; who have gone through the overall, dinner-bucket period; who have studied mankind; have observed the whims, caprices, associations, idiosyncrasies, predilections,

methods of thought and expression of their fellow-workmen. In my own intimate experience with matters relating to accident prevention and safety-first work, I have found that a superintendent who has risen from the ranks is more to be depended upon than the superintendent who has never been a foreman or held a subordinate position in the works. The latter has to have accident hazards pointed out to him; the former recognizes them at a glance.

Training Courses at the Works

A vital question confronting manufacturers to-day is how shall the personnel of the working forces be brought to a higher standard and their efficiency improved. Up-to-date operating practice, saving of waste, the handling of complicated machinery and processes, by-products, etc., all act as an impelling force to improve the quality of employees along both technical and practical lines. Technical high schools and vocational schools will solve this question to a limited extent, but we cannot wait for the development of these schools. It seems to me that we ought now, without any delay, to establish training courses or developing schools right within the confines of our factory walls. This is no new idea, as such schools are already in vogue in shops where intricate electrical machinery and scientific instruments are produced. Put the idea should be taken up and put into effect in blast furnaces, steel works and on down the line to the finished product. Employers should get in close touch with technical schools and academic high schools as well. Encourage these students in the expectancy of receiving employment in the mills and shops. Even promise them employment.

Training courses for salesmen are being resorted to more and more and I have observed superintendents of blast furnaces and steel works taking a salesman's course with the idea of picking up information that will in brief broaden their views. Salesmen are now being taken from their regular duties for several weeks in the year and introduced to the details of mill and factory management, the production of goods and to a limited extent to plant construction. Lectures are given in chemistry, smelting, steel making in all its branches to the finished product, accounting, welfare work, transportation, credit, collections and claims, and the routine of the order department. Examinations both oral and written are held and merit marks given on such characteristics as enthusiasm, energy, ambition, thoroughness, personality, approach, general knowledge, general ability. Note the absence of anything technical.

All Classes Eligible to Works Training

Such training classes should be extended to all branches of an establishment and, as no person is ever too old to learn, should take in superintendents and assistant superintendents and others holding positions of responsibility, including the foremen. Add to these, boys taken from the technical and academic high schools as well as boys from the ranks of those mentioned by Mr. Robinson who are obliged to enter business life on reaching the age of 14, not forgetting the college graduate and even those who have specialized along technical lines. Select men carefully, quickly eliminating those not worth while. Mix them together, let all sorts and conditions of men, mature and youthful, register in these classes, separating them into groups as the occasion and the results hoped for will warrant. The college man and others whose education has been advanced will be all the better for a rubbing with those beneath them scholastically; and the young men and advanced foremen will learn much from the adaptability and readiness of the college men. Let the steel works be a crucible or melting pot for the human element as well as for the base metal. Teach in a simple manner the fundamentals of mechanics and factory management and the laws of physics. Develop character and initiative; encourage ambition; interchange ideas; inaugurate round table talks. Let superintendents be teachers along the lines familiar to them and at the same time students of other essentials of which they are ignorant. Teach them that the brain should be a sample room, not a store room, and let the college men appreciate the fact that the greatest study of mankind is man.

The details of class organization and conduct need not be discussed at this time as with employers it will be a case of every man according to his needs. Training classes of this character ought to develop into good common

sense, practical vocational schools, providing a supply of trained men to meet any call, any emergency, and ultimately many of them will become possessed of what President Lowell says is the most valuable art in life, "to know how far the opinion of an expert must be followed and how far it may be overruled; to know what is really general policy and what is mere detail."

Much Spent for Plant, Little for Training Men

Every ambitious man sincerely desires to secure an education and when we are dealing with an educated man we care not by what means, through what channels, his education was secured. A diploma is only a bit of illuminated paper. To be eligible to membership in a university club is not necessarily an asset. Emerson says: "If a man can write a better book, preach a better sermon or make a better mousetrap than his neighbor, though he build his house in the woods, the world will make a beaten path to his door." And the essayist might well have added that the world will display little interest concerning the source of knowledge which enabled the man to do these things.

We spend money with lavish hand, millions of dollars every year, to improve our physical properties, both buildings and machinery, to reduce cost and improve the quality of our products, and to increase the output, but very little—indeed, from a comparative standpoint, nothing at all—is spent to improve the human element in the shops and mills, to advance the efficiency, to raise to a higher standard the personnel of our working forces. Let us spend money as freely in this equally important work and begin at once.

Addendum

Since writing this paper there has fallen into my hands a copy of the annual report of the Director of Printing at Manila, P. I., for the year ended June 30, 1913. Embodied in it as an appendix I find a remarkably comprehensive and interesting article on vocational training as applied to printing and book-making, from which I take the following:

"As a trainer of men, the printing office easily leads all other mechanical sciences or vocations. Coming in contact as he does with the results of nearly every form of mental and industrial activity, the printer absorbs mathematics, mechanics, language, spelling, grammar, color and composition, and acquires a general education in contemporaneous events."

themselves for positions requiring administrative and executive ability.

"It is apparent, therefore, that the most practicable manner in which to carry on vocational education is through the medium of the *productive establishment*.

"This system of training is commercially practicable in that it may be introduced into a manufacturing plant of any kind without perceptible change in its regular routine."

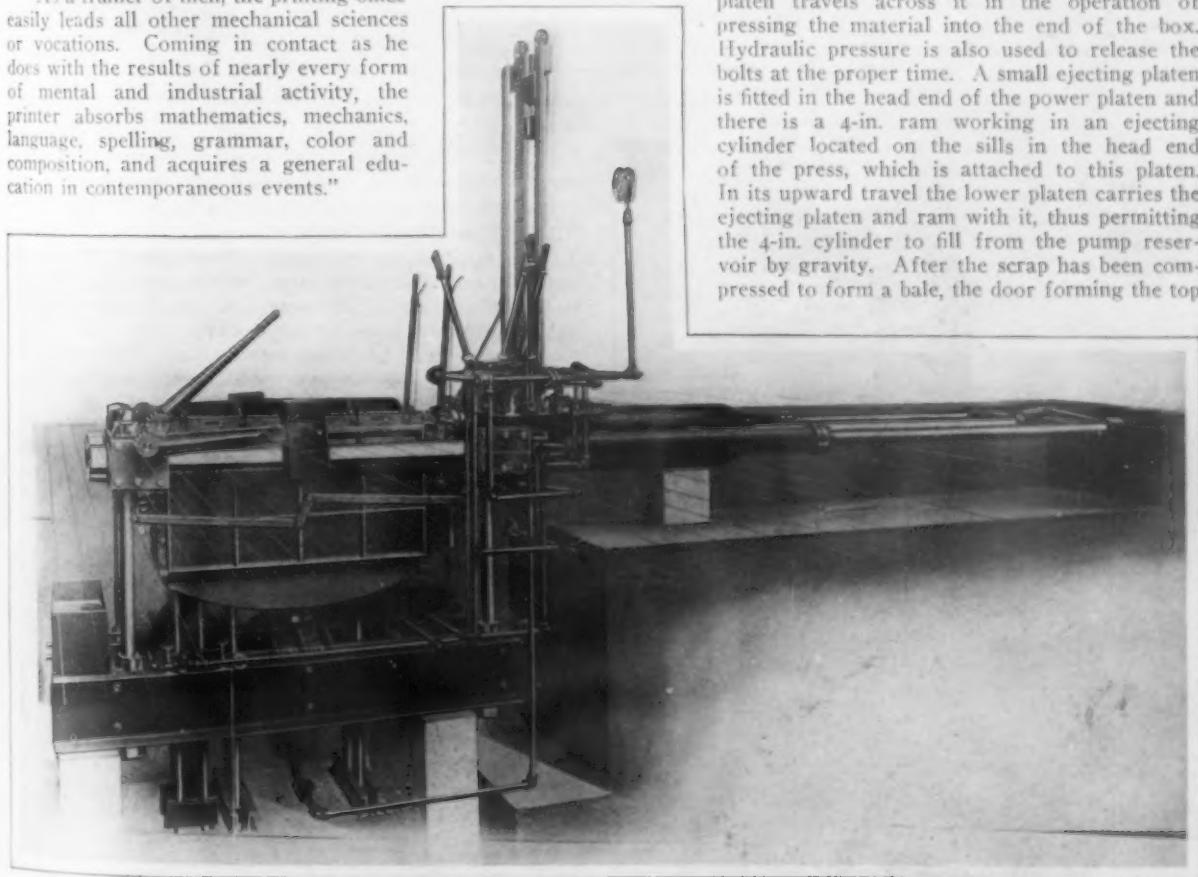
To anyone especially interested in vocational training I recommend a perusal of this report.

Horizontal Sheet Scrap Hydraulic Baling Press

A new type of sheet metal scrap baling press has been designed and built by the Hydraulic Press Mfg. Company, Mt. Gilead, Ohio. It is operated by hydraulic pressure and is capable of exerting a pressure of 200 tons.

The press, which is of the horizontal type, is installed so that the top of the box is flush with the floor line, an arrangement that makes it convenient for forking the scrap which does not exceed No. 10 gauge in thickness into the press without elevating it from the floor. The box is 20 in. wide, 30 in. deep and 60 in. long, while the normal size of the bale is 10 x 12 x 20 in., the weight being 250 lb. The top of the box is a counterweighted cast-steel door which can be moved by a hand lever. With the return of the horizontal ram to its starting position after the bale has been formed the door unlocks and opens automatically.

There are two hydraulic cylinders for supplying pressure. One of these is used for compressing the material in a vertical direction, while the other operates the horizontal ram. There are two auxiliary cylinders attached to the latter cylinder for returning the ram. The bottom of the box forms a pressure platen that is locked in position by two bolts passing into each end of the platen, which are operated by hydraulic pressure after the platen completes its upward movement. This arrangement is relied upon to prevent the platen from being subjected to tilting strains, while the horizontal pressure platen travels across it in the operation of pressing the material into the end of the box. Hydraulic pressure is also used to release the bolts at the proper time. A small ejecting platen is fitted in the head end of the power platen and there is a 4-in. ram working in an ejecting cylinder located on the sills in the head end of the press, which is attached to this platen. In its upward travel the lower platen carries the ejecting platen and ram with it, thus permitting the 4-in. cylinder to fill from the pump reservoir by gravity. After the scrap has been compressed to form a bale, the door forming the top



A New Horizontal Hydraulically-Operated Sheet Metal Scrap Baling Press Receiving Material from the Floor from Shovels and Delivering the Completed Bales at the Same Level

"In addition to graduating competent craftsmen, this system offers student-apprentices an opportunity to equip

of the box opens automatically and pressure is applied to the ejecting cylinder. This causes the ram and the platen

to rise, thus forcing the bale out of the box on a level with the floor.

The valve equipment required for performing all of these operations is controlled by an interlocking device which forces the operator to throw each valve lever in its proper sequence. The positions of the vertical and horizontal pressure platens at all times are indicated to the operator by a tell-tale board with graduations and indicator weights controlled by cables attached to the moving parts of the press.

Slotting Machine for Heavy Forge Work

The Newton Machine Tool Works, Inc., Twenty-fourth and Vine streets, Philadelphia, Pa., has developed an eccentric-driven slotting machine for heavy forge work. It is designed primarily for use in frog and switch work for making the angular cuts on the individual parts and for cutting fillets and key slots in the different members. The machine can also be used for taking square cuts on rails and it is stated that in some cases it will be found more economical than cold sawing machines for this purpose. With a view to securing exact duplication of the different parts the in-and-out feed is fitted with an automatic trip.

A single round nose tool is employed in some cases.

While the rate of output on a square parting operation might be in favor of the rotating saw, it is pointed out that doing the work in this way would give a higher overhead charge than would be the case with the slotting machine, which has a slower rate of production and practically no replacement cost for the tools.

The machine has the driving power of an ordinary 18-in. slotting

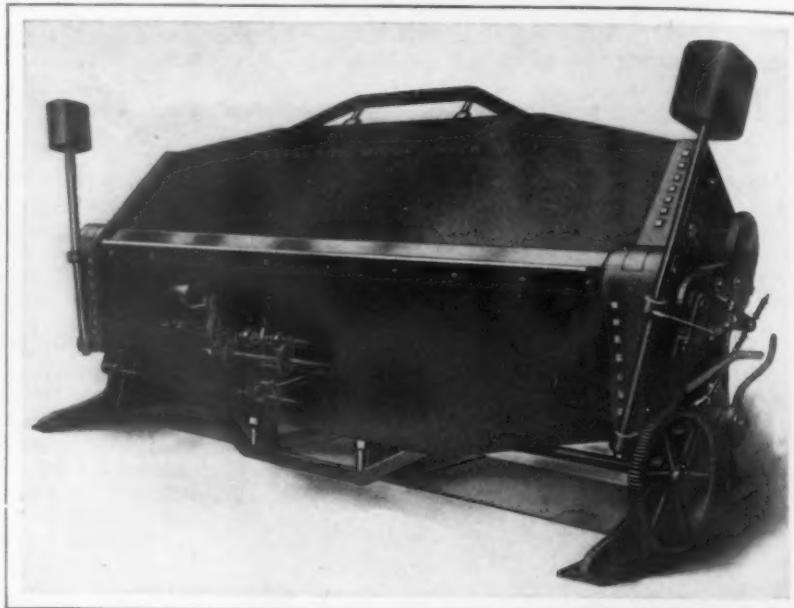
machine and the following table gives the principal dimensions:

Maximum height of work, in.....	12
Maximum stroke, in.....	7
Length of in-and-out feed and hand adjustment, in.....	7
Length of cross feed and in-and-out adjustment, in.....	12
Distance from face of ram to frame, in.....	14
Size of table, in.....	20 x 20

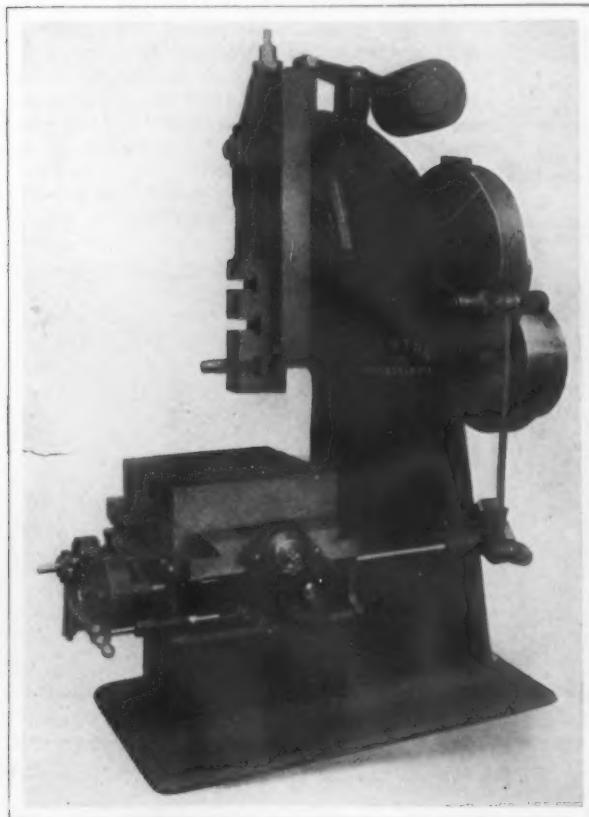
The machine is driven by a 10-hp. motor which it is stated is not excessive for the stresses that this machine will stand.

Motor-Driven Brake with New Clamping Device

An extra heavy type of direct motor-driven power brake has been recently placed on the market by the Drei & Krump Mfg. Company, 2911 South Halsted street, Chi-



A Direct Motor-Driven Power Brake Equipped with a New Type of Clamping Device.



A Recently Developed Slotting Machine for Forge Work Equipped with an Eccentric Drive

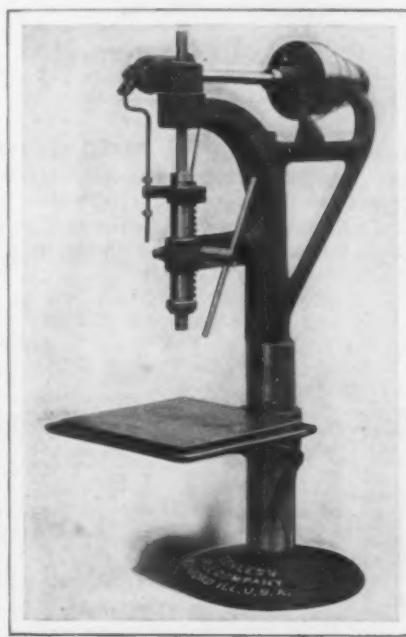
cago, Ill. The special features of the machine are the clamping of material in the brake by power and the location of the motor, as is shown in the lower left portion of the accompanying engraving.

The machine is completely self-contained, the motor being located under the bottom leaf of the brake, where it is out of the way. The power is transmitted from the motor through a rawhide pinion that meshes with a gear on the rear shaft to which two friction clutches are attached. These regulate the raising and lowering of the apron or bending leaf, through the direct and reverse gears, and are controlled by a lever at the end of the machine within easy reach of the operator. This lever regulates the angle to which the sheet or plate is to be bent, although an additional means is provided by an automatic stop gauge, which can be set to make a number of bends to the same angle. This gauge consists of an adjustable collar on the steel gear cut rack, which raises the apron, thus releasing the driving clutch. Emphasis is laid upon the fact that the steel clutch which forms the pinion on the end of the machine is positive in its operation of raising the apron and automatically disengages when the apron is lowered to the extreme point of its travel.

The power clamping arrangement is composed of eccentrics in the lower parts of the connecting links at the ends of the brake. These eccentrics are revolved by double friction dogs pivoted on the arm, which is connected through two springs to the eccentrics on a shaft below. An adjustment is provided for the springs to give the desired tension in clamping the sheet or plate. The raising and lowering of the upper jaw is regulated by the movement of a small handle attached to the double dog. An eccentric in the upper part of the connecting link provides a means of adjustment.

A 12-in. Bench Drilling and Tapping Machine

A new type 12-in. ball bearing bench drilling machine, equipped with a tapping attachment, has been designed and built by the Peerless Drill Company, Rockford, Ill. The construction of this machine is the same in general as the 12-in. ball bearing bench drilling machine, which was illustrated in *The Iron Age*, September 18, 1913. The tapping mechanism is operated by the same lever that controls the spindle for drilling, the advantage of this arrangement being that the operator's left hand is left free for holding the work in place on the table. The machine will tap holes up to a maximum diameter of $\frac{3}{8}$ in. and it is possible to set the stops on the reverse rod to take care of any desired depth of tapping within customary limits. The spindle is driven by spiral gears and runs at the rate of 1000 r.p.m. With a view to giving sufficient room for any jigs that may be used in connection with the drilling and tapping operations, the table has been made somewhat larger than is the custom in machines of this type.



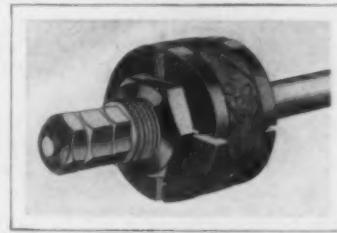
A Recently Developed 12-In. Bench Drilling Machine Equipped with a Tapping Attachment

Expansion Piston for Steam Pump Water Ends

A new type of piston head for use in connection with pumps for different kinds of liquids and more especially for those handling water and similar fluids is being manufactured by the Codd Tank & Specialty Company, 406 West Camden street, Baltimore, Md. The object sought in this piston head was to produce one in which the packing might be readily expanded to produce the necessary fit against the inner cylinder wall to prevent leakage and also to compensate for wear from time to time.

The piston head which is supported by a rod of any of the customary types has an annular flange which is concentric with the rod. This flange has a number of passages for the reception of stems formed on or carried by curved followers, the whole arrangement being substantially that of a cylinder, upon the outer circumference of which the packing rings are applied. The followers are forced radially outward to bring the packing rings into engagement with the inner wall of the cylinder. The inner ends of the follower stems are tapered and threaded to receive a threaded taper sleeve that is slipped over an extension of the piston rod.

In use when it is desired to overcome leakage or to compensate for the wear of the packing from time to time, the sleeve is turned and forces the followers radially outward to expand the rings. The end of the piston rod is threaded to receive a series of lock nuts, as is



A Patented Expansion Piston for Use in the Water Ends of Steam Pumps

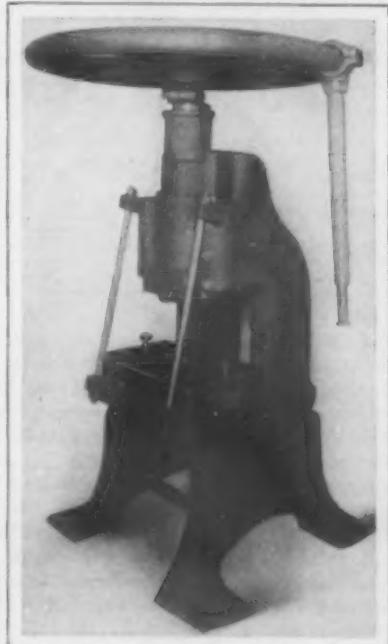
illustrated at the left of the accompanying engraving, to keep the packing in any desired position and guard against accidental displacement and also furnish a means of easy readjustment at any time this becomes necessary.

A Screw Press for Testing Toolroom Dies

For testing the action of cutting dies used in the manufacture of tools and fixtures, the Standard Machinery Company, 7 Beverly street, Providence, R. I., has brought out a new heavy-type hand screw press. It is employed in toolrooms for testing dies that are manufactured for use in power presses. By its use the toolmaker can insert the punch in the ram or the die on the bed and cause them to cut paper, thus determining whether they are properly aligned on the cutting edges or not. Another use of the press is on dies of special forms, where after making the punch and prior to cutting the die, a soft die can be put in the screw press and the ram fed down, thus sinking the form of punch in the die previous to cutting.

The machine, which is capable of handling dies that will fit in die dishes for blanking work up to 16 in. in diameter, is fitted with a quadruple thread, forged steel screw $3\frac{1}{2}$ in. in diameter and a 4-ft. wheel. Tie rods are relied upon to give an accurate alignment so that the dies can be matched and cut to the fineness of thin paper. The nut is fastened to the lower part of the frame by four bolts and the screw is held in the ram proper by a special split collar. The top of the machine is fitted with a special hand thread adjusting collar, so that the wheel can be turned continuously to the left without acting against the thread of the collar. The frame is of heavy and rigid design and is set on legs so that it can be inclined, if desired.

The thickness of the bolster plate is $2\frac{1}{2}$ in. and the maximum distance from the bottom of the ram to the top of the plate is $14\frac{1}{2}$ in., that between the bottom of the ways and the bed being $2\frac{1}{2}$ in. less. The distance between the gibs is $10\frac{1}{4}$ in. and there is a space of $1\frac{1}{2}$ in. between the uprights and the rear. The distance from the center of the ram to the back of the rod is $6\frac{1}{2}$ in. The weight of the press is 3000 lb.



A Screw Press Designed Especially for Testing the Action of the Cutting Dies Used in the Manufacture of Tools and Fixtures

Home Price of Chinese Pig Iron

Vice Consul-General J. Paul Jameson, Hankow, China, furnishes the Daily Consular and Trade Reports with the following information regarding the price at which pig iron is being sold by the Hanyang Iron & Steel Works. The company states that for local sales of foundry pig iron in Hankow it is receiving 33.50 Hankow taels (\$22.52 U. S. gold at present quarterly exchange rate of \$0.669) per ton ex works. The analyses of the Hanyang foundry and steel-making pig iron are:

Foundry:	Silicon.	Mangan.	Phosphorus.	Sulphur.	Carbon.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
No. 1	2.5 to 3.0	0.5 to 1.0	0.1	0.02 to 0.03	3.5 to 3.8
No. 2	2.0 to 2.5	0.5 to 1.0	0.1	0.02 to 0.04	3.0 to 5.4
No. 3	1.5 to 2.0	0.5 to 0.9	0.1 to 0.2	0.04 to 0.05	3.0 to 3.5
No. 4	1.0 to 1.5	0.5	0.1 to 0.2	0.05 to 0.08	2.5 to 3.0
For Siemens-Martin use.	0.8 to 1.5	1.0 to 1.5	0.1 to 0.2	0.01 to 0.05	3.0 to 3.5

Fuel Possibilities in Steel Making*

Experiences with Mechanical and Other Gas Producers and with Tar, Coke-Oven Gas, Pulverized Coal and Other Fuels—Furnace Efficiencies

BY WILLIAM WHIGHAM†

For the purposes of this discussion all fuels may primarily be divided into two groups.

The Fuel Value of Pig Iron

Group I comprises those fuels which come to the steel maker as a component part of the metals with which he works, as for instance the carbon, silicon, manganese and sulphur contents of the pig iron. While not generally referred to as fuels in this connection, yet these are as truly fuels and perform much the same function as those which occur as such in nature and require more or less preparation for the purpose intended—that is to say, the maintenance of a temperature sufficiently high for the thermochemical reactions to take place.

The fuels listed under this class as occurring in the iron received by the steel maker require little attention, as their quantity and consumption, within certain limits, and the methods of their combustion are both approximately fixed. They are of great importance in the Bessemer process, furnishing as they do the sole fuel used in this branch of steel making. One gross ton of representative Bessemer iron contains about the following:

Element	Per Cent.	Pounds.	B.t.u.	Total heat value in gross value per lb. ton of Bessemer metal, when burned to			
				SiO ₂	CO ₂	MnO	B.t.u.
Iron	93.67	2,098.2	.....	.....	.....	.....	.....
Silicon	1.45	32.48	12,600	SiO ₂	409,248	.....	.....
Carbon	4.00	89.60	14,500	CO ₂	1,299,200	.....	.....
Manganese	.75	16.80	2,975	MnO	49,980	.....	.....
Sulphur	.04	.90	.....	.....	.....	.....	.....
Phosphorus	.09	2.02	.....	.....	.....	.....	.....
Totals	100.00	2,240.00					1,758,428

As the sulphur and phosphorus are not oxidized to any extent in the Bessemer process, no heat value has been assigned them. Practically all the silicon, carbon and manganese are burned in the process, and it will be seen from the above table that the heat equivalent for oxidation of the entire quantity of these three constituents amounts to only about 1,750,000 B.t.u. per gross ton of iron blown, or, say, 2,000,000 B.t.u. per ton of steel ingots produced. This is equivalent to 148 lb. of coal having a heat value of 13,500 B.t.u. per pound. It will be seen from this how efficient the Bessemer process is as regards fuel consumption when compared with the open-hearth process using 450 to 600 lb. of fuel per ton of steel in addition to the fuel content of the iron itself.

Were no metallurgical questions involved, the Bessemer process of making steel would probably never have been replaced. The matter of phosphorus elimination, however, has compelled recourse to the open-hearth process where low phosphorus steel is a consideration.

Group II comprises those fuels which are found in nature as such and must be adapted through more or less preparation and through the use of extraneous equipment to the purposes of the steel maker. In what is perhaps the order of their importance they are as follows:

Bituminous Coal

Under this heading are also included the products of coal, viz., tar and by-product coke-oven gas. On account of its wide occurrence, proximity to the other raw materials entering into the making of steel, low cost and ease of conversion into a gaseous state, bituminous coal will probably always be the most generally used fuel in the making of steel by the open-hearth process. It is found in great quantities in western Pennsylvania, West Virginia and southeastern Ohio, which renders it available for use with local fluxes, Lake and imported ores; in Alabama and Tennessee in close proximity to ore and

limestone beds there; in Indiana and Illinois near the Lake ore supply; and in Colorado and Wyoming close to the western ore supplies. It will be thus seen that, both from the standpoint of quantity and location, bituminous coal has a position in the manufacture of steel not easily replaceable by any other fuel.

The proximate analyses and heat values of the coals of the four above-mentioned districts are about as follows:

	Per cent. fixed	Per cent. volatile	Per cent. moisture	Per cent. ash	B.t.u. per lb.
Penna., W. Va. and Ohio (high volatile)	50-60	30-40	1- 1½	6-10	13,700-14,200
Penna., W. Va. and Ohio (low volatile)	70-75	15-20	½- 1	5- 7	14,500-15,000
Alabama and Tenn.	45-50	30-35	1- 5	10-12	12,000-13,000
Indiana and Illinois	40-50	30-40	5- 8	10-12	11,000-12,000
Wyoming and Colorado (bituminous)	35-40	35-40	2- 4	20-25	10,000-10,300
Wyoming and Colorado (lignite)	40-45	35-40	13-17	4- 8	10,300-10,700

The coals utilized in steel making by the open-hearth process are used in the following ways:

MECHANICAL AND HAND-POKED GAS-PRODUCERS

On account of its simplicity of operation, the gas producer has to the present time been the means most generally employed for the utilization of coal in the making of steel in the open-hearth furnace. The making of producer gas is based in general upon the transformation of the free carbon of the fuel into carbon monoxide gas, and it is easily understood therefore that the fuel containing the largest amount of fixed carbon will be the most desirable. In the process of gasification in the producer, the carbon of the fuel is burned to carbon dioxide, the latter being then reduced to carbon monoxide by contact with additional carbon as it rises through the fuel bed. In order to effect reduction to carbon monoxide less air is admitted than is necessary for complete combustion and the height of the fuel bed is regulated according to the quality of the fuels used.

The uniform passage of the gases of combustion through the upper fuel bed is of prime importance, and therefore the crushing and screening of coal to a uniform size for use in producers is practiced where best results are desired. Even with this extra precaution, however, the formation of clinkers and blow-holes throughout the fuel bed is unavoidable unless some method is used of keeping the fuel stirred up. This end was attained at first by hand-poking, and hand-poked producers are still used very generally. The disagreeable character of the work, the expense of labor involved and the irregular results obtained have led to the development of several designs of mechanically poked producers. Steel works engineers are not unanimous as to the advantages of one or the other of the two classes of gas producers mentioned above, and this is probably due in this instance, as in many others connected with engineering and industrial operations, to a lack of accurate data concerning the performance of the two classes of apparatus. Generally speaking, the choice ought to be made on the following points: cost of installation, cost of operation, labor, efficiency.

The first cost, based on large installations, will be about the same per open-hearth furnace served, and may be stated in round numbers as \$25,000 per furnace in either case, which figure includes four hand-poked or two mechanical producers with all coal and ash handling equipment complete. The rated capacity of a 10-foot hand-poked producer is 1000 lb. of coal per hour gasified; the average actual capacity is about 800 lb. per hour, and as a rule about four of these producers are installed for each open-hearth furnace. The rated capacity of the mechanical producer is about 2000 lb. of coal per hour and its actual operating capacity in the neighborhood of 1600 lb.

*Paper read before the American Iron and Steel Institute, Chicago.

†Assistant to the president, Carnegie Steel Company, Pittsburgh, Pa.

per hour. Up to the present time it has been usual to install two mechanical producers per open-hearth furnace; but in some cases five producers have been installed for two furnaces, and it has been suggested that the larger furnaces, making 90 tons of steel at a heat, have three producers each. It can hardly be said that this large producer capacity has been yet justified by results.

A comparison of the cost per ton of coal gasified, including maintenance and repairs as well as direct labor and supplies, for two large plants, shows the following:

Cost to gasify a gross ton of coal (2240 lb.) hand-poked equipment	\$0.745
Cost to gasify a gross ton of coal (2240 lb.) mechanical equipment	.444
Difference in favor of mechanical installation	\$0.301

This difference is practically all in the direct labor, as will be seen from the figures below, taken from the same cost sheets.

Direct labor cost to gasify a gross ton of coal, hand-poked equipment	\$0.509
Direct labor cost to gasify a gross ton of coal, mechanical equipment	.213
Difference in favor of mechanical equipment	\$0.296

These figures indicate about two and one-half times as much labor for the hand-poked as for the mechanical installation, and the whole disadvantage of this excess labor is not indicated by the extra cost. The difficulty at times in securing labor for this purpose is an important element in the decision.

the bulkhead wall of the furnace. Many types of burners have been tried, but nothing better has been found than the simple device consisting of a tar tube inside a tube through which the atomizing air is blown, both tubes being drawn to a relatively small orifice at their delivery ends. The pressure of air used for atomizing is about 80 lb.

The cost of installation, including tar tanks, pumps, air compressors, etc., is small, being in the neighborhood of \$1500 to \$2000 per furnace. As to the possibilities of tar as a fuel for steel making, its limitations are, as stated above, in quantity rather than in any other direction. The uniformity and degree of heat attainable are all that could be expected by the steel maker, but, in view of its comparatively limited production and use in many other directions, it is hardly likely that it will attain any great prominence as a steel-making fuel.

Experiments with by-product coke-oven gas for steel making have been few, and practically no data are available. The quantity of this gas is rather too small in amount and can be utilized so easily to advantage in other directions that it is hardly likely that it will be much of a factor in steel making. It has been used to a considerable extent in the heating of steel for rolling mill purposes and seems to be perfectly satisfactory for this use.

PULVERIZED COAL BURNED DIRECTLY

One of the most promising methods of using coal, both as to the low first cost of equipment and economy in fuel consumption expected from the process, is in the pulverized condition. Coal in this condition has been for some

The Title of This Paper Does Not Fully Indicate the Scope of the Information it Gives. Through the Results of Extended Tests of an Open-Hearth Furnace the Author Makes Out a Strong Case for More Attention to Design in Future Installations of Such Furnaces. The Analysis of the Fuel Question and the Figures on Producer Operation are Particularly Timely.

Both types of producer will deliver to the furnace, either in the form of sensible heat or heat of combustion, 85 to 90 per cent. of the total heat in the coal received by them. Average combined producer and furnace practice will show about 550 lb. of coal to the ton of steel, or 7,425,000 B.t.u., based on 13,500 B.t.u. per pound of fuel.

The conclusion of the writer from the above data is that the mechanical producer should be used in all large installations. It would appear also, from the fact that the mechanical producer has been perfected to an extent where it requires less than one-half the labor for the older type, and, as stated above, shows from 85 to 90 per cent. efficiency as a gas-making apparatus, that radical improvements in its operation are hardly to be looked for. The principal losses, being loss of fuel in the ash and radiation from the producer itself and piping carrying the gases to the furnace, can hardly be expected to be reduced any considerable amount.

BY-PRODUCTS OF COAL, VIZ., TAR AND COKE-OVEN GAS

The by-products of coal, such as tar and coke-oven gas, present greater opportunities for advancement in fuel efficiency, but have their limitations on account of quantity available.

Wherever tar can be obtained in sufficient quantities, its use has been attended with considerable success. Practice in burning tar as a fuel for steel-making purposes shows that 30 to 35 gal. of tar to the ton of steel is easily attainable, and as each gallon contains on an average about 160,000 B.t.u., the total heat in the fuel required to make a ton of steel with tar is about 5,200,000 B.t.u. as compared with 7,425,000 B.t.u. in the case of average producer practice, or about 70 per cent. This is partially accounted for by the fact that the radiation and other producer losses in the case of coal are not present where tar is used. The figures given above, viz., 30 to 35 gal. of tar per ton of steel, were obtained on a 40-ton furnace and represent by no means the economy which might be looked for on a larger furnace. The method of burning tar is to heat it by steam coils to a point where it will readily flow and inject it in an atomized condition through

time used in the burning of cement, in puddling furnaces, in steel-heating furnaces and to some extent under steam boilers. Its advent as a steel-making fuel has taken place only very recently. The principal points to be taken care of, as seen at the present time, are, a thorough drying of the coal, pulverizing to a degree of fineness which will permit 90 per cent. of the fuel to pass through a 200-mesh sieve, and its injection into the furnace in a uniform stream. The high flame temperatures possible with pulverized coal properly burned has suggested that the regenerators in the open-hearth furnace might be replaced entirely with waste heat boilers, which are of course a much more efficient means of reclaiming waste heat than fire-brick used as regenerators. In any event, the use of coal in this way, which injects its entire ash content into the open-hearth furnace, and a large part of it into the passages and checkers beyond the furnace, is going to require a modified design of regenerator. On account of the recent adoption of pulverized coal in steel making, this detail has not been thoroughly worked out.

Natural Gas

Natural gas for the making of steel, as indeed for all other purposes for which fuel is used, is ideal. Its cleanliness, high heat value per unit of volume, freedom from non-combustible and injurious elements, ease of transportation and fixed character, make it the most desirable of all the fuels furnished by nature. The only place where it is found in sufficient quantities to be available for steel making is in western Pennsylvania and West Virginia fields. Its average composition and heat value are about as follows:

Carbon monoxide (CO), per cent.	1.493
Methane (CH_4), per cent.	93.96
Ethylene (C_2H_4), per cent.	1.447
Nitrogen (N_2), per cent.	3.10
	100.06
B.t.u. per cubic foot	1048

On account of its small volume and weight per unit of heat it is not necessary to regenerate it, nor is it possible to do so on account of its composition, as it breaks down at comparatively low temperatures.

The method of burning in the open hearth furnace is simply to carry the gas pipe through the bulkhead of the furnace and bring the gas into intimate contact with the regenerated air. Temperatures are thus attained fully ample for the requirements of steel making. The lack of the necessity for regenerating the fuel gas leaves the entire regenerator space available for preheating the air.

The quantity of natural gas necessary for the production of a ton of steel ingots by the open hearth process is about 5500 cu. ft., having a heat value of 5,766,750 B.t.u. It may vary somewhat above or below this figure, depending upon the size and construction of the furnace and the care with which it is used by those in charge. In the making of steel, and in fact in most metallurgical processes, there is much room for economy, the necessity for which becomes more apparent as the permanency of the supply is threatened. Reliable figures covering the actual heat loss, etc., in an open-hearth furnace using natural gas are available. In the summary which it is intended to make of the question of furnace efficiencies the results obtained from a furnace working on natural gas will be used. As is the case with tar and by-product coke-oven gas, the limitations as to the use of natural gas in steel making are also found in the supply. In the Pittsburgh district, where natural gas has been used most for the making of steel, it is hardly likely that new open-hearth furnaces will be constructed without some kind of coal-burning equipment; and even in the other requirements of

ing into the making of 469 heats, occupying a total of 233 days and 2,78 hours. The results averaged for the 469 heats are given in Table A and show that 12.95 per cent. of the total heat available was found in the steel at tapping time; 1.79 per cent. was in the tapping slag; 1.23 per cent. in the pit slag; 1.57 per cent. and 0.97 per cent. were used in reducing the ore and decomposing the limestone respectively; 30.00 per cent. was absorbed and returned to the furnace by the regenerators; 32.02 per cent. was carried up the stack, leaving 19.47 per cent. for radiation, conduction and unaccounted for. The thermal efficiency of the furnace and regenerators combined, based on the ratio of the first six items enumerated above to the total heat supplied, is shown to be 48.5 per cent. The thermal efficiency of the regenerators is shown to be 38.3 per cent. measured by the ratio of the heat delivered to the incoming air to the total heat in the waste gases leaving the bridge wall.

An examination of these figures indicates that there are two items which can be controlled by design and operation. They are:

RADIATION AND CONDUCTION LOSSES

These vary greatly with the construction of the furnace. Thicker walls will prevent the escape of the heat of the furnace, but at the same time will probably result in higher cost of upkeep due to more rapid deterioration while the walls are still thick. The choice between this

Table A—Heat Balance as Determined from the Average of 469 Open Hearth Heats from the Same Furnace.
(Average tons of steel per heat 53.6.)

From	Total heat received,* with source.			Distribution of heat.*			
	B.t.u. per heat	B.t.u. per ton	Per cent.	To	B.t.u. per heat	B.t.u. per ton	Per cent.
1. Heat of combustion, natural gas	307,707,489	5,740,800	53.91	1. Heat in steel at tapping time....	73,942,900	1,379,500	12.95
2. Heat carried in by regenerated air†	171,153,544	3,193,200	30.00	2. Returned to furnace by regene- rators†	171,153,544	3,193,200	30.00
3. Heat of oxidation of bath.....	59,652,554	1,112,900	10.45	3. Sensible heat in tapping slag....	10,259,083	191,400	1.79
4. Sensible heat of hot metal charge	30,204,480	563,500	5.28	4. Sensible heat in pit slag.....	7,017,958	130,900	1.23
5. Heat of formation of slag.....	1,938,792	36,200	.34	5. Reduction of ore.....	8,969,180	167,300	1.57
6. Sensible heat in natural gas.....	108,719	2,000	.02	6. Decomposition of limestone.....	5,544,694	103,500	.97
				7. Waste gases entering stack.....	182,776,632	3,410,000	32.02
				8. Radiation, conduction and unac- counted for.....	111,101,587	2,072,800	19.47
Totals	570,765,578	10,648,600	100.00		570,765,578	10,648,600	100.00

Thermal efficiency of furnace, including regenerators = Items 1 to 6, inclusive, in distribution above \div total heat = 48.5 per cent.
Thermal efficiency of regenerators = B.t.u. returned to furnace by regenerators \div B.t.u. in waste gases at bridge wall = 171,153,544 \div 446,516,724 = 38.3 per cent

Notes: *All heat values calculated above 62 deg. F.

†"Regenerators" include all passages and checker-work between bridge wall and stack.

steel making, such as ingot heating and reheating, it will also be found desirable to follow along these lines. Probably within a period of 5 to 10 years, unless unanticipated discoveries are made of natural gas supplies in the way of larger and more numerous wells, this fuel will be confined to domestic purposes and the smaller manufacturing operations.

Crude Mineral Oil

Reference to crude mineral oil as a fuel is mainly historical as applied to the making of steel as, on account of the present high cost, it is hardly available for this purpose. It was never used in very considerable quantities, and those works which have used it have been compelled to adopt other fuels. The method of burning it was to atomize it in a burner let through the bulkhead of the furnace in much the same manner as coal tar is used. The consumption was about 45 to 50 gal., or 5,826,600 to 6,474,000 B.t.u., per ton of steel.

Possibilities of Higher Efficiencies in Furnace Construction

Up to this point nothing has been said about the possibilities of better furnace design in order that fuels may be used more efficiently in the furnace. The basis of any improvement along these lines must necessarily be a thorough study of existing practice and a knowledge of the kind and extent of preventable losses. Realizing the lack of specific information in this respect, a thorough test has been carried out on a 50-ton furnace using natural gas, the test having been made on a furnace using this fuel on account of the ease with which the fuel could be measured and the avoidance of inaccuracy through having to take into consideration fuel losses external to the furnace, as is the case in the use of producer gas.

Beginning with September 27, 1911, accurate measurements were taken of the quantities and temperature enter-

and the greater fuel loss, due to thinner walls, involves a considerable amount of judgment. It is impossible to determine without much experiment just where the economical point lies; but it would appear from the construction of a great many open hearth furnaces that a large amount of heat might be saved by thicker and better walls, particularly around the bulkheads and ends of the furnace.

STACK LOSSES

The following shows the average analyses by volume of the stack gases from 469 heats:

CO ₂ , per cent.....	5.31
O ₂ , per cent.....	13.05
CO, per cent.....	.00.00
N ₂ , per cent.....	81.64
	100.00

A study of this analysis will show that there is about two and one-half times as much air present in the stack as is needed theoretically for combustion of the gas. This large excess of air reduces the flame temperature, and the water carried into the furnace as moisture in the air also has a material effect on the temperature. The average flame temperature with the 150 per cent. excess air was 3074 deg. By approaching the theoretical amount of air required higher temperatures might be obtained, thereby reducing the volume of waste gases and the time required per heat, and so lead to fuel economy. To reduce stack losses the temperature and weight per hour of the waste gases must be reduced, and to do this it is absolutely essential to have control of the air supply. This control cannot be had by throttling the air at the remotest source of supply, viz., the air inlet valves, as the furnace is not air-tight and the stack simply supplies its demand through the slag hole, around the door frames and other openings, this leakage not only entering without pre-heating but coming

in where least needed for combustion. Theoretically, one cubic foot of gas requires 9.2 cu. ft. of air for complete combustion. The air meters measured in this experiment on an average 13 cu. ft. of air through the checkers for every foot of gas consumed and the leakage through the furnace was 10 cu. ft. or 77 per cent. excess above that measured.

Effect of Reversal Intervals

The heating and cooling effects of the waste gases and air as measured at the furnace or "hot" end of the regenerator chamber and at the stack or "cool" end of the regenerator chamber shows that, for 20-min. reversals, the gas at the hot end of the regenerator works between 1675 deg. F. at the beginning of the heating period and 2125 deg. F. after the gases have been passing through the regenerators for 20 min., while at the cold end of the regenerator chamber the gases have a temperature of 645 deg. at the beginning of the heating period and rise to 1415 deg. at the end of the 20-min. period. The point of greatest significance is that after the gases have passed for 10 min., further absorption by the checkers is obtained only at the expense of comparatively high stack temperatures. The conclusion in general is that reversals should be of as short an interval as possible consistent with the maintenance of temperatures sufficient for the purposes of the furnace. As a matter of fact reversals on this particular furnace have been cut down to 15 min., with an increase in fuel economy and reduced repairs on the furnace. The temperatures not working over so great a range lead to less wear and tear on the brickwork of the furnace.

Waste Heat Boilers

One other method of recovering the heat in the stack gases offers itself to the engineer, and that is the use of waste heat boilers beyond the checkers, and this method is being used with a high degree of success. One of its disadvantages is the large capacity of boiler required for a given recovery on account of the comparatively low temperatures of the gases. A 75-ton open hearth furnace must be fitted with a 400-hp. boiler in order that 200 to 250 hp. of steam may be developed. Notwithstanding this and other disadvantages, an installation of open hearth waste heat boilers will give a good return on the investment, particularly in localities where fuel prices are high.

Duplex Process

Recent developments in the duplex process have shown a reported fuel consumption of 150 to 180 lb. of coal per ton of steel, which might be expected from the high thermal efficiency of the Bessemer part of the process, and it is highly probable that, if these results are borne out by continued practice, the most economical consumption in steel making will be obtained by the use of this process, in which the open-hearth portion will be carried on with the most economical method of burning fuels as outlined above, viz., some form of fuel consumption in which the entire combustion takes place within the furnace walls, supplemented by furnace construction which will permit of a minimum radiation, large checker chambers with comparatively frequent reversals, and waste-heat boilers between the checker-chambers and the stack.

A brief summary of all the fuel possibilities for steel making is as follows, the fuels being listed in the order which they have been treated above.

Summary

Fuel content of the metals. Developments in the duplex process may give an increased importance to this item.

Bituminous coal. Any considerable advancement in fuel utilization will probably be found in improvements in the methods of applying this fuel to the uses of the steel maker. These will likely be confined to the use of coal in the solid state, as its by-products are too limited in quantity to become an important factor in steel making and producer practice cannot be expected to advance radically, but the burning of coal in a pulverized condition presents possibilities.

Natural Gas. Limitations are found in quantity.

Crude Oil. Because of the limited production and high cost, this will likely become a factor of diminishing value.

Furnace Design and Operation. Opportunities are presented here for fuel economies regardless of the fuel used. Those intrusted with the design of metallurgical furnaces

might well give consideration to a study of the furnace from the standpoint of heat losses only. It is quite likely that the open hearth furnace has not had sufficient thought given to it from this point of view, and the matter of design should be followed up by a thorough study of the best methods of operating the correctly designed furnace.

Discussion by William G. Kranz

William G. Kranz, manager steel works, National Malleable Castings Company, Sharon, Pa., contributed a discussion in writing, in part as follows:

As the National Malleable Castings Company at Sharon, Pa., is probably the pioneer in the application of pulverized fuel to the open-hearth furnace, a short history of the experiments will probably be of interest.

When the price of fuel oil, which we were using in the open-hearth exclusively, began gradually and persistently to advance, we were confronted with the necessity of employing some other and cheaper fuel. The furnaces that had formerly been operated with producers had been increased in capacity so that the producers, flues, etc., were too small, rendering the old equipment practically worthless. New producer equipment would have involved a large expenditure of money, so we directed our attentions to pulverized coal.

Practically all of the steel makers interviewed on the subject were very apprehensive as to the bad effects that might accrue from the siliceous materials in the ash. One quite prominent engineer replied to an inquiry on the subject: "The ash from the coal is blown into the slag and tapped off with it," which, if occurred, would make its use for the basic furnace prohibitive. We nevertheless felt that with extremely fine pulverization the resultant ash would be so light that it would be carried by the draft into the checkers, and possibly a considerable proportion out of the stack. Our assumptions in this regard were substantiated by actual trials, which we had decided to make.

Temporary apparatus was installed after considerable investigation. The pulverized coal was taken in tote boxes to the screw conveyors which feed the coal into the burners. The burners were placed into the end walls of the furnace, as in the case of oil or tar burning.

In order that the experiments would not interfere too seriously with the regular operations of the plant, the trials were made on Sunday evenings. Slag analyses were made at intervals during and at the end of the refining of the metal and proved to be normal, showing that very little of the ash was deposited in the slag.

A second heat was made, with similar results. We then decided to discontinue the experiments and proceed to install permanent apparatus. The first furnace was equipped and has since made several hundred heats, operating practically continuously, using different grades of coal, modifications of the burners and changes in checker construction.

Conclusions

There are three essential requisites in the use of pulverized fuel.

First: The fuel must be very fine; and, in our judgment, better economy will result if carried to a greater degree of fineness than suggested in Mr. Whigham's paper.

Second: The fuel must be dried, expelling all moisture possible.

Third: Adequate means for removing ash from the checkers and flues must be provided.

There are no metallurgical difficulties involved in the use of pulverized fuel except the increase of the sulphur in the metal, and that is directly in proportion to the amount of the element in the fuel. The increase in sulphur, due to the fuel, is not any greater, however, than that in the case of producers using the same fuel.

We feel justified in the belief that the quantity of fuel used per ton of melt will be less than that of the best producer practice.

The Pompton Steel & Iron Corporation has been formed with an office at 339 Spring street, New York, to market the crucible tool steels made by the Ludlum Steel & Spring Company, Watervliet, N. Y., and to handle, as jobber, open-hearth products, sheets, magnet steels, etc. Joseph M. Gilbert is sales manager of the new organization.

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A Menacing Patent Law

Manufacturing interests are taking steps looking to the repeal or amendment of a law recently enacted by Congress (H. R. 7595), the purpose of which is to safeguard foreign exhibitors at the Pan-Pacific Exposition against infringement of patents and kindred rights which may have been granted them in other countries. It is a drastic measure, carrying not only the usual protection under the civil law, but a penalty of fine or imprisonment. The law reads in part:

The proprietor of any certificate of registration, copyright, trade mark or patent issued by any foreign government, protecting any pattern, model, design, copyright, trade mark or manufactured article imported for exhibition and exhibited at said Panama-Pacific International Exposition may, upon presentation of satisfactory proof of such proprietorship, obtain without charge a certificate from said branch office, which shall be legal evidence of such proprietorship. . . . It shall be unlawful for any person without authority of the proprietor thereof to copy, imitate, reproduce or republish any pattern, model, design, trade mark, copyright or manufactured article protected by the laws of any foreign country by registration, copyright, patent or otherwise, which shall be imported for exhibition at the Panama-Pacific Exposition, and there exhibited.

To quote from the report submitted to the recent New York meeting of the National Machine Tool Builders' Association:

From the wording of the act it appears that any article that may be an exact copy of an unpatented one manufactured in this country and that has been registered, copyrighted, patented or protected by trade mark by the foreign manufacturer in the country where the copied article is being made, can be exhibited at the Panama-Pacific International Exposition by the foreign maker, and his article will be protected, while the original manufacturer who is not protected by patents in this country will be prohibited from manufacturing his product under a penalty of imprisonment for a period not exceeding one year, or a fine not less than \$100 nor more than \$1000; and furthermore, this protection shall continue for three years from the date of the closing of the exposition. This law requires only of the foreign manufacturer that he shall own a certificate issued by a foreign government and that he shall exhibit the article at the Panama-Pacific International Exposition in order to be afforded this protection. It is generally known that many machines and mechanical appliances not patented in this country have been copied and patented abroad by European machine builders, and the latter by exhibiting these copies at San Francisco can make it illegal for American manufacturers to continue the manufacture of their own unpatented article.

The argument may be made that very few cases would arise to which the provisions of this special act would be applicable. And without doubt the courts of the United States would see justice done. If a foreigner deliberately appropriated an unpatented American product, took out a patent abroad and registered it under this law, the establishment of the facts would probably result in a decision dealing fairly with the American manufacturer. Yet he might be put to much expense and trouble. Moreover, such a statute is entirely unnecessary. Under the international agreement the foreigner who has secured a patent in his own country may, upon application, have his idea guarded under American law. It is his right. He has nothing to fear from showing the fruits of his genius —providing the idea has the requisite novelty and is his own, by invention or purchase. The clause making infringement a crime is ridiculous. Accidental infringement is entirely possible, and has sometimes happened under existing patent laws. The civil law

affords ample redress. The statute in question was doubtless intended as an inducement to foreign manufacturers to show their latest products at San Francisco. If some premium is necessary, Patent Office fees might be rebated; but to go to the length of this singular law has more possibilities of harm than good.

The New Steel Works Training

For several years vocational training has been a live issue in the various organizations of manufacturers in foundry and machinery lines. Conventions of the National Foundrymen's Association and the National Metal Trades Association, in particular, have given prominence to papers and discussions dealing with this important question. In these associations the training of apprentices has been the matter under consideration, and continuation courses and training which divided the apprentice's time between the shop and the class room have been coming more and more into vogue.

While comparatively little has been done by iron and steel manufacturers to provide educational facilities for their employees, the recent Chicago meeting of the American Iron and Steel Institute, the proceedings of which we have quite freely reported in last week's and the present issue, showed that a change is under way. At the May meeting of the Institute, held in New York, reference was made to the school started by the Carnegie Steel Company, in which a selected number of young men are given a two years' course in the operations of steel making. The persons selected for this training include both college men and those who have come to the mill from the lower school grades. In taking the prescribed course they are subject to discipline in the department to which they are attached just the same as regular workmen in that department. While it is yet too soon to speak of definite fruits of this plan in the strengthening of the organization which has undertaken it, there is no doubt in the minds of those who are carrying it out that the money outlay will be returned many fold. Plainly it is from the ranks of these who are being broadly trained in the varied manufacturing processes carried on by the employing company that selections are likely to be made for places of responsibility.

Two addresses on vocational training, delivered at the Chicago meeting of October 24 and printed in full elsewhere in this paper, are calculated to stir the leaders in the steel industry to action on this important question. If organization, more than plant and coal and iron ore reserves, has rightly been credited with the conspicuous successes in American steel manufacture, it is certainly high time depreciation in organization received some attention along with depreciation of plant. Thus far the Carnegie Steel Company and the American Steel & Wire Company have been conspicuous for initiating in steel manufacture an educational work comparable with that which the General Electric Company for a good many years has carried on so effectively in machinery manufacture. It is a movement that bids fair to go much farther. No matter what changes are made in the courses of technical schools or what adaptations of public school courses to the needs of boys about to enter on their life work, no substitute will be found for special training given to picked young men under the direction of those who are

at the same time dealing with the problems of everyday mill and shop operations.

Influence of the Panama Canal Now Felt

After so many years of anticipation and preparation, it is extremely interesting to observe that the opening of the Panama Canal is so close at hand as to exert a tangible influence on commercial conditions in the Pacific coast States. Our San Francisco letter this week has considerable to say with regard to the manner in which buyers and consumers of various kinds of iron and steel are awaiting developments after the opening of the canal. They expect such reductions in the cost of commodities delivered on the coast as will considerably modify the prices which have latterly prevailed there. It will be a disappointment to the people of those States if the competition for freight of the steamship lines running through the canal will not considerably reduce the cost of a great deal of the merchandise for which that section depends on manufacturers on or near the Atlantic seaboard.

An Eight-Hour Day by Federal Force

No more pernicious legislative proposal has been made in a long time than that embodied in a bill just introduced in Congress by Representative Lafferty, "limiting the hours of labor of persons engaged in producing interstate commerce." Briefly, it provides that six months after the passage of the act, no manufactured article produced in works where the eight-hour day is not in force shall be transported by any common carrier, under penalty of fine or imprisonment or both. The provisions of the bill are so absurd that probably no legislative or administrative body would give them serious consideration, yet publicity should be given them as signs of the times. The bill, omitting the enacting clause, is as follows:

That six months from and after the passage of this act it shall be unlawful for any carrier of interstate commerce to transport or accept for transportation into any other state or territory of the United States than the one wherein produced or manufactured, the products of any mill, factory or manufacturing establishment of any kind in which the employees are required or permitted to work more than eight hours in any one day or more than six days in any one week.

That in order to have its products enter into interstate commerce the owner, principal officer, or general manager of any mill, factory or manufacturing establishment, whether incorporated or unincorporated, must file an affidavit with the Interstate Commerce Commission to the effect that the employees of such mill, factory or manufacturing establishment are not required or permitted to work more than eight hours in any one day or more than six days in any one week, whereupon the Interstate Commerce Commission shall give notice to all common carriers that the products of such mill, factory or manufacturing establishment may enter into interstate commerce.

That any officer, agent or employee of any common carrier who is a party to any violation of this act shall be punished for each offense by a fine of not more than \$3000 nor less than \$500, or by imprisonment not exceeding one year, or by both such fine and imprisonment, in the discretion of the court. Any owner, principal officer or general manager of any mill, factory or manufacturing establishment required by this act to file an affidavit, as herein provided, who fails or refuses to file such affidavit or who shall make a false statement in such affidavit shall be punished for each such offense by a fine not exceeding \$5000 nor less than \$1000, or by imprisonment not exceeding one year, or by both such fine and imprisonment, in the discretion of the court.

Industrial evolution may in time bring more generally the eight-hour day though that is not the route by which commercial leadership is to be won in the international race. We are a long way from the day when eight hours of productive effort out of the 24 can be made the universal economic standard. But all other comment on this preposterous bill is secondary to what should be said of the centralizing tendency of so many recent proposals to overturn the economic status in the United States. Federal control of interstate commerce is being invoked in all imaginable ways to regulate matters which heretofore have been subjects of individual contract or have been controlled by State or local governments. Along with the growing propensity for legislating concerning every condition in life is this projection of the arm of federal authority into the people's affairs in a way that is by no means to be lightly regarded.

Basis of Ad Valorem Rates of Duty

A feature of the new tariff act is the radical change which has been made in the basis for the imposition of duties. From the time of the passage of the Morrill tariff in 1861, it has been the policy of our tariff makers to apply specific duties on imports wherever possible. Specific duties are such as are levied at a fixed sum on the unit of measurement or weight. For instance, a duty of \$2 per ton on pig iron is a specific duty. The new tariff, however, largely abandons specific duties and substitutes for them an ad valorem duty. An ad valorem duty is levied at a certain percentage on the value of the article imported and thus does not take into consideration any unit of measurement.

The wide extension of ad valorem duties in the new act has brought out inquiries with regard to the manner in which such duties are to be levied. The impression prevails that ad valorem rates are computed on imported articles according to the price at which such articles are sold in this country. This is not the case. The ad valorem rates are levied on the price of the article at the place of origin, and detailed directions are given in Section III of the tariff act covering the manner in which importers shall prepare their invoices for the scrutiny of the customs authorities in this country. These provisions require all invoices of imported merchandise to be made in the currency of the place or country whence the importations shall be made; that all such invoices shall be submitted to the consular officer of the United States in the district in which the merchandise was manufactured or purchased, and shall have indorsed thereon a declaration signed by the purchaser setting forth that the invoice is correct. If the article is obtained in any other manner than by purchase (as for instance by consignment for sale in this country), the invoice must show the actual market value in the principal markets of the country whence it is exported.

In this way the basis is established on which the ad valorem duty is to be levied. It will be seen, therefore, that this value does not include freight to the United States, commission to any agent, insurance or other charges. An example of the way in which a rate is levied will be found in the case of beams. The rate fixed on beams is 10 per cent. ad valorem. If beams should be bought for importation in this country at Antwerp, Belgium, at \$26 per ton, the duty imposed

would be 10 per cent. of that rate, or \$2.60 per ton. To get the full cost of such beams delivered at seaboard on this side of the Atlantic, it would be necessary to add to the duty the freight, commission, insurance and any other of the usual charges.

Correspondence

A Successful Suggestion Box Plan

To the Editor:—Referring to the article, "Using the Suggestion Box Successfully," on page 820 of *The Iron Age* of October 9, 1913, I wish to offer information as to another practice that is an improvement on the scheme mentioned. Below are forms devised by me and used at the David Bradley Manufacturing Works, Bradley, Ill., during my management there. The great objection to all the usual schemes of handling suggestions is the lack of fairness and justice that is bound to be in evidence. This plan is "fool proof," as far as I can see.

LUCIEN I. YEOMANS,
Industrial Engineer.

CHICAGO, October 23, 1913.

SUGGESTIONS:

We will pay on the first pay-day in each period two prizes for the best suggestions to better the operation of the plant or improve our product made by employees working by the hour, during the preceding period. A first prize of \$15.00 for the best suggestion and a second prize of \$10.00 for the next best will be paid. No other payment will be made for other suggestions than the two decided upon as prize winners, although others may be adopted.

The manner of handling suggestions to insure absolute fairness and freedom from prejudice on the part of anyone is as follows:

A supply of numbered coupons printed in red will be kept on the employees' entrance bulletin board where anyone made take them. Write out your suggestion as fully as possible and say how, in your opinion, it will better our operation or product. Attach the smaller gummed part of one of the numbered coupons by sticking it on the written suggestions, seal it in an envelope addressed Superintendent's Office and put it in any shop mail box. Tear off the larger half of the coupon and keep it in your possession. After the end of the period the numbers entitled to prizes will be posted on the bulletin board and the Time Keeper's Office will cash them on presentation of the larger half of the coupon slip by the holder. The numbers of other suggestions which will probably be adopted will also be posted, although they receive no payment.

A large percentage of the most valuable suggestions made to any management come from the men in the factory and we wish to encourage a spirit of co-operation along these lines as much as possible.

Salaried men occupying positions as foremen are not included in the above proposition.

DAVID BRADLEY MANUFACTURING WORKS.

By
SUPERINTENDENT.

Tear this part of coupon
off and keep it in your
possession.

.....
No. 1328
.....

M-279

The Value of the Impact Test

To the Editor:—In the account that you give on page 937 of your issue of October 23, you misunderstood what

I said about the impact test. While it is true that I said that some engineers held that the impact test shows nothing which cannot be had from the tensile test, yet I differed radically with them, holding that it does show much which cannot be learned from the tensile test. My conclusions are given in the following memorandum:

Harmoniousness.—The results of the impact test are usually much less harmonious than those of the tensile test. The deviations in one series are about five times as great as those in the tensile strength, and about double those in the elongation. Yet in one extended investigation the mean deviations are less than 1 per cent.; that is, not greater than in tensile testing. This discordance may be due to heterogeneity of any kind, and especially to coarseness of structure.

Speed of Impact.—Though in many cases the impact resistance is affected but little by the speed of impact, yet in others it increases materially with that speed, reminding us that the tensile strength also increases slightly with the rate of straining, on the average of a large series of tests.

Special Teaching.—The impact test excels the tensile test very greatly in distinguishing between fine and coarse material, a distinction often of very great importance. It also excels the tensile test as a means of measuring the local injury done by flaws, sonims, segregation, etc.

Limitation.—Because it is affected very greatly by the plastic deformation, it is misleading as a basis for comparing steels of different carbon contents intended for hypo-elastic uses. Its use is rather for comparing varying states of a given steel due to varying heat treatments.

Modification.—It may be possible to increase its usefulness greatly by comparing the angle bent with the work done, and thus arriving at the hypo-elastic work, instead of at present reporting the hypo- and the hyper-elastic work together.

HENRY M. HOWE.

BEDFORD HILLS, N. Y., October 27, 1913.

Our Currency Not Inelastic

To the Editor:—May I add the following to the discussion of the pending currency bill which appeared in *The Iron Age* of September 25:

My view of the government's state of mind on the currency question may briefly be expressed in the statement that it is a perfectly needless anxiety and alarm over something that does not exist, and that would not matter very much if it did exist. That imaginary thing is the idea that in our present system the volume of currency is fixed and inelastic.

The free coinage of gold law seems to be overlooked. The effect of that law is plainly to increase automatically the volume of currency just as fast as production and exchange increase. This by drawing gold to the mints when the bullion price, or the price of manufactured gold, falls below the coinage value, as it does the instant business forges ahead of the volume of currency.

So it is not true that in our present system the volume of currency is fixed and inelastic. It is automatically—that is to say, ideally—elastic. But even if it were inelastic, that would not be the serious matter the government takes it to be. It would not mean contraction of business. It would not mean curtailment of credit. How could it, with prices falling automatically with the currency supply? What it would mean would be steadily falling commodity prices simply. And the consequent annoyance and inconvenience would be infinitely preferable to the injury to business inevitably resulting from giving the control of the currency over to a populistic or paternalistic or communistic government, which would cheerfully defy nature and inflate when contraction is the only salvation, as it is in times of stringency.

It is a mistake to infer that a money stringency is due to business getting ahead of the supply of money. It cannot get ahead of the supply of money even when that is fixed, which is not now the case, and the volume of business enormously expanding. The stringency is due to the distrust of those who have the currency or the wealth to exchange for the currency. And to seek to make good the vanishing currency by government manufacture of more currency instead of seeking to remove the cause of capital's stringency is, as far as production is concerned, a perform-

ance like filling a sieve with water—and first boring additional holes in the sides of the sieve. Government loans in times of stringency increase capital's timidity by intensifying and prolonging the conditions responsible in the first place for the timidity. The cause and the cure will both be easy to find when once we look for them.

In the meantime, nature's slow and painful cure for the unhealthy conditions scaring capital (a more or less prolonged cessation of production) must be relied on, and must not be interfered with by a blundering government.

GEORGE AUCHY.

TACONY, PHILADELPHIA, October 30, 1913.

Rust-Proof Treatment for Iron and Steel

To the Editor: In *The Iron Age* of August 21, page 393, a formula was given for manufacturing a rust-proof treatment for iron and steel. In this formula three ingredients—calcium resinate, manganese borate and lead acetate—are nothing more than dryers used to hasten the drying action of linseed oil. Naphtha is used for thinning and the artificial graphite to give color and hiding power. The article stated that artificial graphite was necessary for the purpose, which we fail to see because the only purpose of the graphite is to afford hiding power.

In our opinion, the secret of the success of this formula is baking the linseed oil at 300 deg. F. for one hour and forty minutes. Without this baking, we do not believe this mixture will be any better than any good linseed oil paint. We hardly see where such a method can be of use to any of the readers of *The Iron Age* because most of their products are of such size that it will be impossible to put through this baking process.

Baking has considerable to do with the success of finishes now being used on metal furniture, trim, etc. By a proper cooking of linseed oil, the varnish manufacturer is able to produce a vehicle which, when mixed with pigments and baked at temperatures from 300 to 500 deg. F., depending upon the particular article, forms a tough, elastic coating which adheres firmly to the metal and is unaffected by water, mineral oil, etc. This baking process is now being used by some of the largest manufacturers of railroad signals, and it has been often demonstrated that these particular varnishes baked at high heat are far more weather resisting than the old-fashioned coach varnishes.

MOLLER & SCHUMANN COMPANY,
Carl Schumann, Secretary.
BROOKLYN, N. Y., October 28, 1913.

The Proposed Freight Rate Increase

Speculation as to just what the railroad freight rate increases sought by the carriers of the United States amount to was set at rest November 2 by Commissioner Judson Clements of the Interstate Commerce Commission. Commissioner Clements said:

"Broadly speaking the rate increases sought by the railroads are on a general average of five per cent. I do not believe that the suggestion that the increases sought are horizontal in character rather than on an average is justified by the facts, or that the increases sought amount, as is alleged in some instances, to from 16 to 40 per cent. The average rate of five per cent. of increase is, however, not universal and in instances there will undoubtedly develop a partial justification for the statement that the average rate runs slightly higher than that figure."

Koppers Company Changes

The H. Koppers Company, Chicago, has established a benzol department and has appointed in charge of this work Franz Püning, who has had a very extensive experience with benzol plants in foreign countries and is an expert in benzol plant construction. C. J. Ramsbury, for 16 years associated with the United Gas Improvement Company, Philadelphia, has been appointed to succeed Thomas V. Salt, resigned, as second vice-president of the company. The latest plant to be completed by the Koppers Company is being charged this week at the Indiana Harbor works of the Inland Steel Company.

Twelve Furnaces Less

Pig Iron Curtailment Is Now Marked
Capacity Active November 1 More than 4800 Tons a Day
Below That of October 1—Production
May Be Further Reduced

Blast furnace operations reflect distinctly the falling off in the demand for steel products. Our returns from the producers of coke pig iron show that output in the 31 days of October was 2,546,261 gross tons, or 82,133 tons a day, against 2,505,927 tons for the 30 days of September, or 83,531 tons a day. The curtailment was largely contributed by steel company furnaces, their output dropping off 1300 tons a day, while that of the merchant furnaces fell off slightly less than 100 tons a day. It is expected that November will show some further blowing out of furnaces, one or two having gone out since the month opened. The net loss in active furnaces last month was 12. The capacity of the 244 in blast November was 78,558 tons a day, against 83,375 tons a day for 256 furnaces on October 1.

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, from October, 1912, is as follows:

	Daily Rate of Pig-Iron Production by Months—Gross Tons.		
	Steel Works.	Merchant.	Total.
October, 1912	62,820	23,952	86,772
November	62,817	24,878	87,695
December	63,770	25,996	89,766
January, 1913	63,921	26,251	90,172
February	64,005	28,364	92,369
March	61,448	27,699	89,147
April	64,658	27,101	91,759
May	64,232	26,807	91,039
June	62,002	25,617	87,619
July	59,362	23,239	82,601
August	59,140	22,981	82,121
September	60,941	22,590	83,531
October	59,630	22,503	82,153

Output by Districts

The accompanying table gives the production of all coke and anthracite furnaces in October and the four months preceding:

Monthly Pig-Iron Production—Gross Tons.

	June (30 days)	July (31 days)	Aug. (31 days)	Sept. (30 days)	Oct. (31 days)
New York	186,818	174,050	178,277	178,852	158,288
New Jersey	10,996	10,922	11,006	10,800	11,236
Lehigh Valley	86,818	79,942	80,921	79,217	82,304
Schuylkill Valley	77,428	76,400	58,692	52,328	53,130
Lower Susquehanna and Lebanon Val.	52,500	51,553	53,044	48,713	50,766
Pittsburgh district	562,249	559,275	571,007	587,122	640,819
Shenango Valley	140,184	145,834	136,297	143,322	142,116
Western Pennsylva. Maryland, Virginia and Kentucky	147,397	139,787	143,169	136,143	132,898
Wheeling district	122,584	120,160	117,580	109,057	106,462
Mahoning Valley	250,061	257,092	264,648	270,104	278,428
Central and Northern Ohio	241,003	230,203	239,050	222,930	228,619
Hocking Valley, Hanging Rock and S. W. Ohio	38,271	33,273	34,192	34,708	37,966
Chicago district	389,949	372,754	356,572	345,338	326,973
Mich., Minn., Mo., Wis., Col., Wash.	71,407	68,966	66,096	64,263	58,835
Alabama	163,525	160,564	164,236	157,254	161,365
Tennessee	23,309	19,684	13,490	13,317	15,610
Total	2,628,565	2,560,646	2,545,763	2,505,927	2,546,361

Production of Steel Companies

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in these figures, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons.

	Pig, Total production	Spiegeleisen and ferromanganese
January	1,128,448	1,483,153
February	1,185,782	1,550,995
March	1,518,063	1,827,792
April	1,434,142	1,830,717
May	1,310,378	1,922,557
June	1,281,241	1,823,958
July	1,316,646	1,803,205
August	1,460,610	1,843,404
September	1,490,898	1,773,073
October	1,560,884	1,947,426
November	1,452,907	1,884,524
December	1,453,446	1,976,870

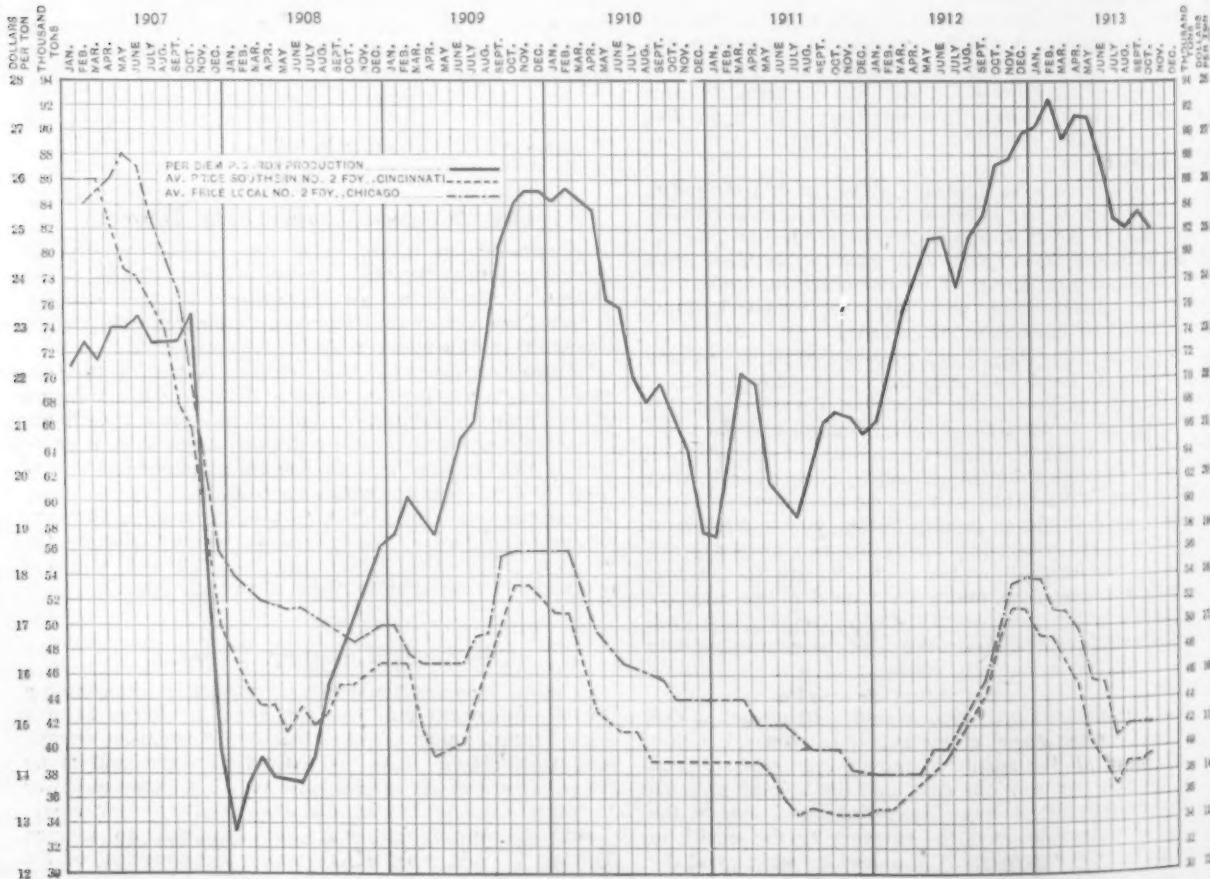


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to November 1, 1913; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

Capacity in Blast November 1 and October 1.

The following table shows the daily capacity, in gross tons, of furnaces in blast November 1 and October 1 by districts:

Location of Furnaces	Coke and Anthracite Furnaces in Blast.				
	Total number of stacks in blast.	Nov. 1 Number in blast.	Capacity per day.	Oct. 1 Number in blast.	Capacity per day.
New York:					
Buffalo	19	13	4,460	16	5,638
Other New York	7	2	364	2	325
New Jersey	7	2	362	2	360
Pennsylvania:					
Lehigh Valley	22	9	2,415	9	2,558
Spiegel	2	1	81	1	82
Schuylkill Valley	16	7	1,716	7	1,744
Lower Susquehanna	7	4	805	5	1,019
Ichanon Valley	10	4	643	4	605
Pittsburgh District	52	44	19,150	45	19,601
Spiegel	4	3	340	4	575
Shenango Valley	19	13	4,322	14	4,661
Western Pennsylvania	27	15	4,450	15	4,486
Maryland	4	3	894	3	875
Wheeling District	14	9	3,385	10	3,607
Ohio:					
Mahoning Valley	25	21	8,322	23	8,767
Central and Northern	24	19	7,141	20	7,431
Hocking Val., Hanging Rock, & S. W. Ohio	15	10	1,341	10	1,259
Illinoian and Indiana	34	23	9,648	26	11,171
Spiegel	2	1	208	1	161
Mich., Wis., and Minn.	10	6	1,261	6	1,272
Colo., Mo., and Wash.	8	1	350	2	648
The South:					
Virginia	24	8	860	5	548
Kentucky	5	2	315	2	296
Alabama	46	21	5,235	21	5,242
Tennessee	20	3	490	3	444
Total	423	244	78,558	256	83,375

Furnaces blown out in October include three Lackawanna in the Buffalo district, one Crane in the Lehigh Valley, making that group entirely idle, one furnace of the Pennsylvania Steel Company at Steelton in the Lower Susquehanna Valley, one Clairton, one Duquesne, one Monessen and one Aliquippa in the Pittsburgh district, Punx in western Pennsylvania, Atlantic in the Shenango Valley, one Bellaire in the Wheeling district, Cherry Valley and Niles in the Mahoning Valley, Franklin and Dover in Ohio, Globe in the Hanging Rock district, one Iroquois, one Gary and one Madeline in the Chicago district, one stack of the Colorado Fuel & Iron Company, Alice in Alabama, Johnson City in Tennessee.

The furnaces blown in last month include one Carrie in the Pittsburgh district, Pulaski, Covington and one Crozer in Virginia, Lawrence in the Hanging Rock district, Philadelphia in Alabama, Napier in Tennessee, one Cambria in western Pennsylvania.

Diagram of Pig-Iron Production and Prices

The fluctuations in pig-iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The figures for daily average production are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons.							
1907.	1908.	1909.	1910.	1911.	1912.	1913.	
January	71,149	33,918	57,975	84,148	56,752	66,384	90,172
February	73,038	37,163	60,976	85,616	64,090	72,442	92,369
March	71,821	39,619	59,232	84,459	70,036	77,591	89,147
April	73,885	38,289	57,962	82,792	68,836	79,181	91,759
May	74,048	37,603	60,753	77,102	61,079	81,051	91,039
June	74,486	36,444	64,656	75,516	59,585	81,358	87,619
July	72,763	39,287	67,793	69,305	57,841	77,738	82,601
August	72,594	42,851	72,546	67,963	62,150	81,046	82,057
September	72,783	47,300	79,507	68,476	65,903	82,128	83,531
October	75,386	50,554	83,856	67,520	67,811	86,722	82,133
November	60,937	51,595	84,912	63,659	66,648	87,697	.....
December	39,815	56,158	85,022	57,349	65,912	89,766	.....

The Record of Production

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1908—Gross Tons.						
1908.	1909.	1910.	1911.	1912.	1913.	
Jan.	1,045,250	1,797,560	2,608,605	1,759,326	2,057,911	2,795,331
Feb.	1,077,740	1,707,340	2,397,254	1,794,509	2,100,815	2,586,337
Mar.	1,228,204	1,832,194	2,617,949	2,171,111	2,405,318	2,763,563
Apr.	1,149,602	1,738,877	2,483,763	2,064,086	2,375,436	2,752,761
May	1,165,688	1,883,330	2,390,180	1,893,456	2,512,582	2,822,217
June	1,092,131	1,930,864	2,265,478	1,787,566	2,440,745	2,628,565
July	1,218,129	2,103,431	2,148,442	1,793,068	4,10,889	2,560,646
Aug.	1,359,831	2,248,930	2,106,847	1,926,637	2,512,431	2,543,763
Sept.	1,418,998	2,385,206	2,056,275	1,997,102	2,463,839	2,505,927
Oct.	1,567,198	2,599,541	2,093,121	2,102,147	2,689,933	2,546,261
Nov.	1,577,854	2,547,508	1,909,780	1,999,433	2,630,854	.....
Dec.	1,740,912	2,635,680	1,777,817	2,043,270	2,782,737	.....

Blast Furnace Notes

The Cambria Steel Company, Johnstown, Pa., had all of its eight furnaces in blast on November 1. No. 4 furnace having been blown in late in October after reconstruction. Its capacity has been brought up from 300 tons to 450 tons a day.

The Colorado Fuel & Iron Company blew out another furnace of its Pueblo group on October 25 and now has but one out of six stacks in blast.

The Lackawanna Steel Company blew out its No. 2 furnace on October 3 and Nos. 1 and 7 on October 4. Four furnaces were in blast November 1.

The furnace of the Penn Iron & Coal Company, Canal Dover, Ohio, was blown out November 2. The Cherry Valley furnace of the Hanna interests, at Leetonia, Ohio, went out on November 1.

Three furnaces in the Pittsburgh district were blown out in October—No. 2 Clairton, No. 3 Aliquippa and one of the new furnaces of the Pittsburgh Steel Company at Monessen.

Both furnaces of the Republic Iron & Steel Company in the Shenango Valley are now out of blast, Atlantic having gone out in October.

Virginia increased the number of its active furnaces by two in October, Covington furnace of the Low Moor Iron Company and one Crozer furnace of the Virginia Iron, Coal & Coke Company being added to the list. Eight Virginia furnaces are now in blast.

Lawrence furnace of the Marting Iron & Steel Company, Culbertson, Ohio, was blown in October 28, after having been shut down for a few weeks on account of a shortage of water. Several wells have been drilled meantime.

The furnace of the Globe Iron Company, Jackson, Ohio, was blown out October 29 for relining.

Germany's Exports for Nine Months

The following table gives some statistics of Germany's exports of iron and steel in September and for nine months ended with September, in metric tons (2204 lb.):

	September	Jan. September
Pig iron	90,074	59,137
Scrap	13,060	12,189
Semi-finished steel	51,828	65,362
Beams	45,408	30,590
Other structural shapes	74,548	87,983
Heavy plates	24,660	34,202
Thin plates	8,963	10,563
Wire, rolled or drawn, plain	25,795	22,070
Wire, polished	12,078	19,148
Wire nails	4,430	6,264
Tubing	14,627	19,306
Steel rails	44,691	40,363
Steel railroad ties	12,675	10,133
	131,148	99,528

The total exports of iron and steel, including manufactured products, in September were 509,700 metric tons, which was about 21,000 tons more than in August and about 7000 tons more than in September, 1912.

A Visit from German Foundrymen.—Members of the Verein Deutscher Giessereifachleute are planning a six weeks' trip of inspection and study of the large American iron foundries for the spring of 1914. The announcement of the trip in Giesserei Zeitung for October 15 states that the results of the inspection will be discussed later in a general meeting of the German foundrymen.

The affairs of the Busch-Sulzer Bros. Diesel Engine Co., whose plant at St. Louis, Mo., is now practically completed, will not be adversely affected by the death of Adolphus Busch, who was the controlling owner and who died in Germany recently. The will of Mr. Busch provides that the holdings in his name in the company shall be held intact for a considerable period and that the management of affairs shall be vested in his son August A. Busch, who as a matter of fact, has latterly been the active financial figure in the company. August A. Busch, it is also provided, may personally acquire the holdings at any time at a price agreed upon by the trustees of the estate.

The Southwestern Steel Corporation, Houston, Texas, which proposes to build a large plant at Texas City, plans to make wire in various forms, nails, cotton ties, reinforcing steel bars, and rails. Some details regarding the company were published in *The Iron Age* of October 30.

The Iron and Metal Markets

Cutting Down Production

Pig Iron Rate Reduced 15 Per Cent.

Lower Prices on Semi-Finished and Finished Steel—German Bars Offered at 1.25 Cents Seaboard

The cutting down of pig iron production forced by the falling off in steel consumption is but partly represented in the October statistics. A good many furnaces which contributed to the October output were blown out in the latter part of the month and a few have gone out since November opened.

In the 31 days of October coke iron production was 2,546,261 gross tons, or 82,133 tons a day, against 2,505,927 tons in September, a 30-day month, or 83,531 tons a day. There was a net loss of 12 furnaces last month and the 244 furnaces in blast November 1 had a capacity of 78,558 tons a day, against 83,375 tons a day for 256 furnaces on October 1.

Thus, while the production in October was about 1400 tons a day less than in September, the capacity in blast November 1 was over 4800 tons a day less than on October 1, and still declining. Production at the opening of this month, estimating charcoal iron at 1000 tons a day, was at the rate of 29,000,000 tons a year, against a rate of 34,000,000 tons reached last February at the climax of the late movement—a reduction of about 15 per cent.

Further declines in prices are reported this week, but as in every other like time of hesitation, buying is on so restricted a scale that the inducement to make deep cuts is lacking. Conditions are not ripe for a broad buying movement like that of two years ago.

Railroad buying has been somewhat better in the Chicago district, and inquiry for track fastenings has been larger both East and West; but heavy railroad buying plainly waits on the decision of rate advances, which is now likely to be delayed for some months. The Reading Railroad has placed 24,000 tons of rails with the Pennsylvania, Bethlehem, Carnegie and Lackawanna steel companies, the first-named being given 11,000 tons. The Louisville & Nashville is in the market for 50,000 tons, and inquiries have come from the St. Paul, Illinois Central and Atchison. The Lorain, Ohio, mill will roll 6000 tons of girder rails just booked for Buenos Aires. The Norwegian State Railways open bids November 28 for 17,000 tons.

Recent structural contracts include 2500 tons for a B. & O. bridge over the Potomac, 2000 tons for the Lake Washington canal lock gates at Seattle and 2500 tons for a mining company at Juneau, Alaska. New York elevated and subway work will soon be coming to the mills in larger volume. For the Fourth Avenue elevated extension in Brooklyn bids will be taken on 27,000 tons of steel November 27, and on November 18 for 4600 tons for the Queens elevated connection with the Steinway tunnel, while 10,000 tons of New York subway work also comes up this week.

An unusual contract just closed for reinforcing bars calls for 5000 tons for the new Massachusetts Institute of Technology buildings at Boston. Bar shipments from the mills have held up quite well. In the past week 1.35c., Pittsburgh, has become a common price for steel bars, and sales have been made at 1.30c. Where foreign bars can get in, as on the seaboard, the Pittsburgh price would have to be shaded further. Eastern buyers have been quoted 1.25c. on German steel bars at Atlantic port, duty paid. At Galveston, Texas, German bars have been quoted at 1.25c., f.o.b.,

to which must be added 8 per cent. duty and 1½ per cent. for custom house expenses.

Thus far no considerable sales in this country by foreign steel makers, apart from those on the Pacific coast, can be traced. English rail makers have been asked to quote on 3000 tons of rails for shipment to a southern port, presumably for the San Antonio & Aransas Pass Railroad.

It is known, also, that low prices have been quoted by Welsh tin plate makers on oil can sizes for domestic consumption on the Atlantic seaboard, probably in connection with quotations on drawback plates to the same consumers. A reduction to \$3.40 a box on ordinary domestic tin plate business was announced at Pittsburgh this week.

Billet and sheet bar prices have declined under the pressure of steel from smaller producers, and open hearth billets and sheet bars have been brought to a parity at \$22, Pittsburgh, and somewhat lower.

The pig iron market is weaker. Basic has sold at \$15 in eastern Pennsylvania, and on a 5000-ton sale in the Pittsburgh district \$13.25, Valley furnace, was the basis, while some iron has been offered as low as \$13. Foundry iron is very dull and lower, consumers showing no interest in purchases for 1914. Yet foundry operations have shown relatively less curtailment than those involving the use of steel.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous.

Pig Iron, Per Gross Ton:	Nov. 5, 1913.	Oct. 29, 1913.	Oct. 1, 1913.	Nov. 6, 1912.
Foundry No. 2 X, Philadelphia.	\$15.75	\$15.75	\$16.00	\$18.75
Foundry No. 2, Valley furnace.	13.50	13.75	14.00	16.75
Foundry No. 2 S'th'n, Cin'ti.	14.25	14.25	14.25	17.25
Foundry No. 2, Birmingham, Ala.	11.00	11.00	11.00	14.00
Foundry No. 2, furnace, Chicago*.	15.00	15.00	15.00	17.50
Basic, delivered, eastern Pa.	15.00	15.25	15.25	18.00
Basic, Valley furnace.	13.25	13.75	14.00	16.25
Bessemer, Pittsburgh.	16.15	16.40	16.65	17.90
Malleable Bessemer, Chicago*.	15.00	15.00	15.00	17.50
Gray forge, Pittsburgh.	14.25	14.30	14.40	16.40
Lake Superior charcoal, Chicago	15.25	15.25	15.25	18.25

Billets, etc., Per Gross Ton:

Bessemer billets, Pittsburgh.	22.00	22.50	24.00	27.00
Open-hearth billets, Pittsburgh.	22.00	22.50	24.00	27.50
Open-hearth sheet bars, P'gh.	22.00	23.00	25.00	28.00
Forging billets, Pittsburgh.	26.00	26.00	30.00	34.00
Open-hearth billets, Philadelphia	23.50	24.00	25.00	30.00
Wire rods, Pittsburgh.	26.00	26.50	27.00	29.00

Old Material, Per Gross Ton:

Iron rails, Chicago.	13.50	13.50	14.00	18.00
Iron rails, Philadelphia.	17.50	17.50	17.50	18.00
Carwheels, Chicago.	12.00	12.00	12.25	16.50
Carwheels, Philadelphia.	12.00	12.25	13.00	15.00
Heavy steel scrap, Pittsburgh.	11.50	11.50	12.00	15.50
Heavy steel scrap, Philadelphia.	10.50	11.00	11.75	15.50
Heavy steel scrap, Chicago.	9.75	10.00	10.00	13.75
No. 1 foundry cast, Pittsburgh.	12.00	12.00	12.75	14.75
No. 1 foundry cast, Philadelphia.	13.00	13.50	13.50	14.75
No. 1 f'dry cast, Ch'go (net ton)	10.25	10.25	10.50	13.50

Finished Iron and Steel,

Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bessemer rails, heavy, at mill.	1.25	1.25	1.25	1.25
Iron bars, Philadelphia.	1.32½	1.32½	1.32½	1.67½
Iron bars, Pittsburgh.	1.45	1.50	1.55	1.55
Iron bars, Chicago.	1.15	1.15	1.35	1.50
Steel bars, Pittsburgh.	1.30	1.35	1.40	1.60
Steel bars, New York.	1.46	1.51	1.56	1.76
Tank plates, Pittsburgh.	1.30	1.30	1.40	1.60
Tank plates, New York.	1.46	1.46	1.56	1.76
Beams, channels & angles, P'gh.	1.30	1.30	1.40	1.55
Beams, channels & angles, N. Y.	1.46	1.46	1.56	1.71
Skelp grooved steel, Pittsburgh.	1.30	1.30	1.35	1.40
Skelp, sheared steel, Pittsburgh.	1.35	1.35	1.45	1.45
Steel hoops, Pittsburgh.	1.50	1.50	1.60	1.50

Sheets, Nails and Wire.

Per Pound to Large Buyers:	2.00	2.00	2.05	2.25
Sheets, black, No. 28, Pittsburgh.	2.00	2.00	3.10	3.40
Galvanized sheets, No. 28, P'gh.	3.00	3.00	3.10	3.40
Wire nails, Pittsburgh.	1.60	1.60	1.65	1.70
Cut nails, f.o.b. Eastern mills.	1.65	1.65	1.70	1.75
Cut nails, Pittsburgh.	1.55	1.55	1.55	1.70
Fence wire, ann'Td, 0 to 9, P'gh.	1.40	1.40	1.45	1.50
Barb wire, galv., Pittsburgh.	2.00	2.00	2.05	2.10

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Coke, Connellsville,

	Nov. 5.	Oct. 29.	Oct. 1.	Nov. 6.
Per Net Ton at Oven:	1913.	1913.	1913.	1912.
Furnace coke, prompt shipment.	\$1.90	\$2.00	\$2.15	\$4.00
Furnace coke, future delivery..	2.00	2.10	2.25	3.00
Foundry coke, prompt shipment	2.65	2.75	2.90	4.25
Foundry coke, future delivery..	2.75	3.00	3.00	3.75

Metals,

Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York.....	16.87 1/2	16.87 1/2	16.62 1/2	17.50
Electrolytic copper, New York..	16.50	16.62 1/2	16.50	17.25
Spelter, St. Louis.....	5.20	5.30	5.45	7.35
Spelter, New York.....	5.35	5.45	5.60	7.50
Lead, St. Louis.....	4.20	4.20	4.50	4.60
Lead, New York.....	4.35	4.35	4.65	4.75
Tin, New York.....	10.25	10.10	10.75	10.15
Antimony, Hallett's, New York	7.25	7.25	7.75	9.75
Tin plate, 100-lb. box, Pittsburgh	\$3.40	\$3.50	\$3.50	\$3.60

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22 1/2c.; Kansas City, 42 1/2c.; Omaha, 42 1/2c.; St. Paul, 32c.; Denver, 84 1/2c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier, 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, 1/4 in. thick, 6 1/4 in. up to 100 in. wide, 1.30c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, 1/4 in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered 1/4-in. plates. Plates over 72 in. wide must be ordered 3/4 in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.

Cents per lb.

Gauges under 1/4 in. to and including 3-16 in.....	.10
Gauges under 3-16 in. to and including No. 8.....	.15
Gauges under No. 8 to and including No. 9.....	.25
Gauges under No. 9 to and including No. 10.....	.30
Gauges under No. 10 to and including No. 12.....	.40
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles 3 ft. in diameter and over.....	.40
Boiler and flange steel.....	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel.....	.30
Marine steel.....	.40
Locomotive firebox steel.....	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.....	1.00
Cutting to lengths, under 3 ft. to 2 ft., inclusive.....	.25
Cutting to lengths, under 2 ft. to 1 ft., inclusive.....	.50
Cutting to lengths, under 1 ft.....	.15
No charge for cutting rectangular plates to lengths 3 ft. and over.	

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, 1/4 in. thick and over, and zees, 3 in. and over, 1.30c. to 1.35c. Extras on other shapes and sizes are as follows:

Cents per lb.

I-beams over 15 in.....	.10
H-beams over 18 in.....	.10
Angles over 6 in. on one or both legs.....	.10
Angles, 3 in. on one or both legs, less than 1/4 in. thick, as per steel bar card, Sept. 1, 1909.....	.70
Tees, structural sizes (except elevator, hand rail, car-truck, and conductor rail).....	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.....	.20 to .80
Deck beams and bulb angles.....	.30
Hand rail tees.....	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive.....	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.....	.50
Cutting to lengths, under 1 ft.....	1.55
No charge for cutting to lengths 3 ft. and over.	

Wire Rods and Wire.—Bessemer, open-hearth and chain rods, \$26. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, \$1.40; galvanized, \$1.80. Galvanized barb wire, to jobbers, \$2; painted, \$1.60. Wire nails, to jobbers, \$1.60.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.								
Nos.	0 to 9	10	11	12 & 12 1/2	13	14	15	16
Annealed	\$1.60	\$1.65	\$1.70	\$1.75	\$1.85	\$1.95	\$2.05	\$2.15
Galvanized	2.05	2.05	2.10	2.15	2.25	2.35	2.75	2.85

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe in effect from October 27, 1913, and iron pipe from June 2, 1913, all full weight:

Inches.	Steel.	Black.	Galv.	Butt Weld.		Iron.	Black.	Galv.
				Inches.	Black.			
1/4, 3/4 and 1 1/4	73	52 1/2	56	1/4 and 3/4	66	47	47	47
1/2	77	66 1/2	65	1/2	65	46	46	46
3/4 to 3	80	71 1/2	69	3/4 to 2 1/2	72	61	61	61

Lap Weld.		Reamed and Drifted.		
1 to 3, butt.....	78	69 1/2	1 to 1 1/2, butt.....	70
2, lap.....	75	66 1/2	2, butt.....	70
2 1/2 to 6, lap.....	77	70 1/2	1 1/2, lap.....	54
7 to 12.....	76	65 1/2	2, lap.....	68
13 to 15.....	53	52 1/2	2 1/2 to 4.....	70
			4 1/2 to 6.....	61
			7 to 12.....	68

Butt Weld, extra strong, plain ends.	
1/4, 3/4 and 1 1/4	68
1/2	73
3/4 to 1 1/2	77
2 to 3	78

Lap Weld, extra strong, plain ends.	
2	74
2 1/2 to 4	76
4 1/2 to 6	75
7 to 8	68
9 to 12	63

Butt Weld, double extra strong, plain ends.	
1/2	63
3/4 to 1 1/2	66
2 to 2 1/2	68

Lap Weld, double extra strong, plain ends.	
2	64
2 1/2 to 4	66
4 1/2 to 6	65
7 to 8	58

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads on lap-welded steel, in effect from May 20, 1913, and standard charcoal-iron boiler tubes, in effect from January 1, 1913, are as follows:

Standard Charcoal Iron.
1 1/4 and 2 in.....
2 1/4 in.....
2 1/2 and 2 1/4 in.....
3 and 3 1/4 in.....
3 1/2 to 4 1/4 in.....
5 and 6 in.....
7 to 13 in.....
1 1/2 in. and smaller, over 18 ft., 10 per cent. net extra.
2 1/4 in. and larger, over 22 ft., 10 per cent. net extra.
Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets.	Cents per lb.
Nos. 3 to 8.....	1.45 to 1.50
Nos. 9 and 10.....	1.50 to 1.55
Nos. 11 and 12.....	1.55 to 1.65
Nos. 13 and 14.....	1.60 to 1.70
Nos. 15 and 16.....	1.70 to 1.75

Bos Annealed Sheets, Cold Rolled.	Cents per lb.
Nos. 10 and 11.....	1.65 to 1.75
No. 12.....	1.65 to 1.75
Nos. 13 and 14.....	1.70 to 1.80
Nos. 15 and 16.....	1.75 to 1.85
Nos. 17 to 21.....	1.80 to 1.90
Nos. 22 and 24.....	1.85 to 1.95
Nos. 25 and 26.....	1.90 to 2.00
No. 27.....	1.95 to 2.05
No. 28.....	2.00 to 2.10
No. 29.....	2.05 to 2.15
No. 30.....	2.15 to 2.20

Galvanized Sheets of Black Sheet Gauge.	Cents per lb.
Nos. 10 and 11.....	2.00 to 2.10
No. 12.....	2.10 to 2.20
Nos. 13 and 14.....	2.10 to 2.20
Nos. 15 and 16.....	2.25 to 2.35
Nos. 17 to 21.....	2.40 to 2.50
Nos. 22 and 24.....	2.55 to 2.65
Nos. 25 and 26.....	2.70 to 2.80
No. 27.....	2.85 to 2.95
No. 28.....	3.00 to 3.10
No. 29.....	3.15 to 3.25
No. 30.....	3.30 to 3.40

Pittsburgh

PITTSBURGH, PA., November 5, 1913.

Restriction of output has begun among the blast furnaces and steel works. The Carnegie Steel Company now has 14 blast furnaces idle and 45 in operation. Four or five of those idle are isolated stacks and have not been operated for some years, while others are being relined and repaired. No. 3 furnace of the Jones & Laughlin Steel Company at Aliquippa is out and two of the Talbot open-hearth furnaces at Aliquippa are idle, also several of the open-hearth furnaces in the South Side plant. Steel mills are now running nearly full up to Saturday morning of each week, then closing down until Monday morning. Sheet and tin plate mills run until Thursday or Friday morning and then close. Several large steel companies say it will be their policy to restrict production rather than to attempt to run full and possibly bring about demoralization in prices. While there has been no serious break in the market, the tendency is steadily downward, and on nearly all lines of semi-finished and finished material prices are lower this week than last. Bessemer and basic iron have gone off nearly 50c. a ton, and billets and sheet bars are quoted at \$22 or less. Steel bars have sold at 1.30c. Foreign bars, made from basic Bessemer steel, have been offered at 1.25c., Boston, or on a parity with 1.07c., Pittsburgh. Local makers of steel bars say they will not meet this price, and jobbers have stated they would agree to pay \$3 a ton for domestic bars over foreign, on account of better service and quality. While it is hard to find anything encouraging in the situation, yet a fair amount of new business is being placed, but only in small lots, and consumers continue to urge prompt shipments, showing that stocks are badly depleted. The situation seems to be that there is no fixed price on any material, but that each inquiry is taken up and considered separately. A break has come in furnace coke and the market is weak at \$1.90 at oven for best grades. Scrap continues dull and neglected, with prices ruling lower than for several years.

Pig Iron.—A decline of 50c. a ton or more has taken place in prices of Bessemer and basic iron, and the market is weak, with rumors of iron being offered at still lower prices than are quoted in this report. Last week the Carbon Steel Company bought 5000 tons of basic for December-February shipment at not above \$13.25 at Valley furnace, or \$14.15, Pittsburgh, and reports are that a slightly lower price was made. The same interest bought 500 tons of Bessemer for this year's delivery at about \$15.25, Valley furnace. W. P. Snyder & Co. report the average price of Bessemer iron in October to have been \$15.703 and of basic \$13.700, both at Valley furnace, to which 90c. should be added for Pittsburgh or Cleveland delivery. Sales were small, there having been not over 1000 tons of Bessemer and possibly 5000 tons of basic. These prices are a little over 4c. a ton lower than the average prices for September. In the early part of last week a sale of 1500 tons of Bessemer was reported at \$15.70 and another of 1000 tons at \$15.75, but subsequently there were sales of 500 tons of Bessemer at \$15.25 and 400 tons at a slightly lower figure. We note a sale of 1500 tons of gray forge iron at \$13.35, Valley furnace, to a local consumer. Prices on foundry iron are weaker, and No. 2 is being offered at \$13.50, Valley. We also note a sale of 1000 tons of malleable Bessemer for November and December at \$14, Valley. We quote: Bessemer, \$15.25; basic, \$13.25; No. 2 foundry, \$13.50 to \$13.75; malleable Bessemer, \$14; gray forge, \$13.35, all at Valley furnace, the rate for delivery in the Cleveland or Pittsburgh districts being 90c. a ton.

Billets and Sheet Bars.—The steel market has settled down to a lower basis, and a feature of the situation is that the usual differential of about \$1 a ton in favor of sheet bars over billets has almost disappeared. There seems to be more pressure on the part of sheet mills to sell sheet bars than billets, and this accounts for the fact that prices on both are about the same. There is little new inquiry for steel, but it is said that large consumers of sheet and tin bars are willing to close their requirements now for all of next year on the basis of about \$22, Pittsburgh. The mills that were offered this business declined to take it. We quote open-hearth and Bessemer billets for delivery over the remainder of the year at \$22, and Bessemer or open-hearth sheet bars at \$22, maker's mill, Pittsburgh or Youngstown. We note, however, that a Youngstown producer of steel would not deliver steel in the Pittsburgh market at the above prices, nor would a Pitts-

burgh producer agree to deliver steel in the Youngstown district at \$22 for billets or bars. We quote forging billets at \$26, and axle billets about \$24, maker's mill, Pittsburgh.

Steel Rails.—No large orders for 1914 delivery have been taken by the local interest. There is a fair run of small orders of standard sections, ranging from 100 to 500 tons, which aggregate considerable tonnage. The new demand for light rails is fairly active, especially from coal mining interests. Rerolling rail mills continue to quote prices on light rails about \$8 a ton less than on rails rolled from billets. We quote splice bars at 1.50c. per lb. and standard section rails at 1.25c. per lb. Light rails are quoted as follows: 25, 30, 35, 40 and 45 lb. sections, 1.25c.; 16 and 20 lb., 1.30c.; 12 and 14 lb., 1.35c., and 8 and 10 lb., 1.40c., all in carload lots, f.o.b. Pittsburgh.

Muck Bar.—The Youngstown Sheet & Tube Company, Youngstown, Ohio, and A. M. Byers Company, Girard, Ohio, and Pittsburgh, have declared their puddling mills open, which have been idle since July 1. Both state that they will not treat with the Sons of Vulcan as an organization, but will pay Amalgamated rates. There is not much new inquiry for muck bar, but it is somewhat scarce and prices are firm. We quote best grades, made from all pig iron, at nominally \$31 to \$32. Eastern muck bar is being offered at about \$30 per ton delivered in this district.

Plates.—New inquiries for cars are better, and some contracts have been placed. The Chicago & Northwestern Railroad has placed 2000 steel hopper cars with the Barney & Smith Car Company. The Buffalo, Rochester & Pittsburgh is still in the market for 1000 box cars and 1000 gondolas. The Cambria Steel Company has taken 1000 steel coke cars for the Pennsylvania Railroad Lines East. The Pittsburgh-Wabash Terminal is in the market for 2000 coal cars and the Wabash for 500 hopper car bodies. The Lehigh & New England is inquiring for 200 gondolas and 500 hoppers. It is also reported that the New York Central is figuring on a large number of cars, but this is not confirmed. A San Francisco concern is the low bidder on the dock in Pearl Harbor, Hawaiian Islands, for which about 3500 tons of plates, shapes and bars will be used. The general demand for plates is dull and prices are weak. We quote $\frac{3}{4}$ in. and heavier tank plate at 1.30c., but as low as 1.25c. has been named on recently placed business.

Structural Material.—New inquiry is light, but a fair amount of work is being placed. The American Bridge Company has taken about 2600 tons of bridge work for the Baltimore & Ohio Railroad at Magnolia and Kessler's Curve, W. Va., while the Jones & Laughlin Steel Company has taken about 525 tons for new coal barges, 300 tons for a new mill building at Greensboro, N. C., and about 500 tons of plates and shapes for furnace bindings and soaking pit work for the new open-hearth steel plant of the Broken Hill Proprietary Company at New Castle, New South Wales, Australia. The city of Pittsburgh is figuring on a new cantilever bridge in Bloomfield in this city that will require about 2500 tons. The market continues weak. We quote beams and channels up to 15 in. at 1.30c., Pittsburgh, but the market is in such condition that on large tonnage this price might be shaded.

Wire Rods.—With little new demand, the market is weak, in sympathy with wire products. We quote Bessemer, open-hearth and chain rods at \$26, Pittsburgh.

Ferralloys.—A local firm has sold 100 tons of English 80 per cent. ferromanganese at \$50, seaboard, securing this business in competition with German, which was offered at \$49.50 or less. There is not much new inquiry, but the price on English seems to be well maintained. We quote 80 per cent. foreign ferromanganese at \$50, Baltimore, the freight rate to the Pittsburgh district being \$2.16 a ton. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at \$75; over 100 tons to 600 tons, \$74; over 600 tons, \$73, Pittsburgh. We quote 10 per cent. ferrosilicon at \$22; 11 per cent., \$23, and 12 per cent., \$24, f.o.b. cars Jackson County, Ohio, or Ashland, Ky., furnaces. We quote 20 per cent. spiegeleisen at \$25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, and 12c. in lots up to 2000 lb.

Skelp.—In sympathy with other lines of finished material, the skelp market has quieted down a good deal and prices are weak. While we do not quote below 1.30c. on grooved steel and 1.35c. on sheared, it is very likely these prices could be shaded on desirable business. We quote grooved steel skelp at 1.30c.;

sheared steel skelp, 1.35c.; grooved iron skelp, 1.55c., and sheared iron skelp, 1.60c., delivered to buyers' mills in Pittsburgh district.

Iron and Steel Bars.—The decline of \$1 per ton or more on steel bars has not stimulated the demand, nor was it expected by the mills that it would. The lower prices ruling on finished iron and steel bars simply reflect the dull condition of the market and are in sympathy with the weakness existing in prices on other finished material. The new demand for steel bars is light and only for small lots, and mills report that specifications against contracts are only fair. The mills still have a moderate amount of business on their books and are running mostly on contracts placed some time ago. There has been some slowing down in operations, and the output of both iron and steel bars is materially less than it was some time ago. The new demand for iron bars is also very dull, with all the mills in need of orders. We quote steel bars for prompt or forward delivery at 1.30c. to 1.40c. and iron bars at 1.45c., but the latter price would be shaded on any desirable orders. Local warehouses are charging about 1.85c. on small lots of steel bars for spot delivery.

Sheets.—Two leading makers report that new orders for sheets in the past three or four days have been more numerous, but they are nearly all for small lots on which buyers ask for prompt shipment, thus showing urgent needs to replenish stocks. As yet there is no disposition among consumers to anticipate and they are all buying from hand to mouth. The leading consumer is holding No. 28 Bessemer black sheets at 2c. and No. 28 galvanized at 3c., Pittsburgh, but for certain points of delivery these prices are shaded. This comes from the fact that some sheet mills are giving up any advantage they may have in freight rates and are quoting f.o.b. at mill and adding actual freight to point of delivery. Some of the larger consumers and jobbers have been trying hard to place contracts for sheets at present prices for delivery over the first half of 1914, but the mills do not care to commit themselves so far ahead at present low prices. It is stated none of the mills is entering orders for first quarter except in a few isolated cases. It is not believed that the output of sheets at present is more than 60 per cent. of the capacity of the mills. We quote Nos. 9 and 10 blue annealed sheets at 1.50c. to 1.55c.; No. 28 Bessemer black, 2c. to 2.05c.; No. 28 galvanized, 3c. to 3.10c.; No. 28 tin mill black plate, H. R. and A., 2c.; Nos. 29 and 30, 2.05c. These prices are f.o.b. Pittsburgh, in carload and larger lots, jobbers charging the usual advances for small lots from store.

Tin Plate.—On Monday, November 4, the American Sheet & Tin Plate Company fixed prices on tin plate for 1914 delivery on the basis of \$3.40 for 100-lb. cokes and \$3.30 for 100-lb. ternes. On September 10, 1912, prices on 100-lb. cokes were fixed at \$3.60 and on 100-lb. ternes at \$3.50 but conditions in the tin-plate trade, and also in the general steel business, were very much better in September of last year than they are now, and for this reason the manufacturers decided to fix a lower base price. As yet no contracts have been placed by leading consumers, and it will take some little time to show how they will take hold. Tin-plate mills continue to curtail operations, and the output at present is not over 60 to 65 per cent. of total capacity. For some time most of the tin-plate mills have been accumulating stocks for shipment early in the year against expected contracts. We now quote 100-lb. cokes at \$1.40 and 100-lb. ternes at \$3.30 per base box f.o.b., Pittsburgh.

Railroad Spikes.—Makers report that practically no new business is being placed. None of the railroads is in the market, and contracts have been cleaned up, so that the spike business is about as dull at this time as it could possibly be. Very low prices continue to be made on spikes in Chicago and other Western districts. Not enough new business is being placed to test the market, but we quote railroad spikes in base sizes, 5/8 x 9/16 in., at \$1.55, and small railroad and boat spikes in carloads at \$1.65 per 100 lb. f.o.b., Pittsburgh.

Bolts and Rivets.—The new discounts on nuts and bolts that went into effect recently have given more stability to the market, but up to this time have not stimulated new demand to any considerable extent. Jobbers and consumers are still placing orders mostly for small lots to cover current needs, but are not buying ahead. The new demand for rivets is only fair and for small lots. Operations among boiler shops and other consumers of rivets have quieted down a good deal, and this has restricted new demand very materially. We quote button head structural rivets \$1.80 to \$1.85 in

large lots and \$1.90 to \$1.95 in small lots, and cone head boiler rivets at \$1.90 to \$1.95 in large lots and \$2 to \$2.05 in small lots. Terms 30 days net, less 2 per cent. for cash in 10 days. The new discounts on nuts and bolts are as follows: In lots of 300 lb. or over, delivered with a 20c. freight radius of makers' works:

Coach and lag screws.....	80 and 20% off
Small carriage bolts, cut threads.....	75 and 17 1/2% off
Small carriage bolts, rolled threads.....	80 and 2 1/2% off
Large carriage bolts.....	70 and 15% off
Small machine bolts, cut threads.....	80 and 2 1/2% off
Small machine bolts, rolled threads.....	80 and 7 1/2% off
Large machine bolts.....	75 and 10 and 2 1/2% off
Machine bolts, with C.P.C. and T nuts, small.....	70 and 12 1/2% off
Machine bolts with C.P.C. and T nuts, large.....	70 and 12 1/2% off
Square hot pressed nuts, blanked and tapped.....	\$6.00 off list
Hexagon nuts.....	\$6.70 off list
C.P.C. and R square nuts, tapped and blanked.....	\$5.80 off list
Hexagon nuts, 3/8 and larger.....	\$6.80 off list
Hexagon nuts, smaller than 9/16.....	\$7.40 off list
C.P. plain square nuts.....	\$5.30 off list
C.P. plain hexagon nuts.....	\$5.70 off list
Semi-finished hexagon nuts, 3/8 and larger.....	85 and 10% off
Semi-finished hex. nuts, smaller than 9/16.....	85 and 5% off
Rivets, 7/16 x 6 1/2, smaller and shorter.....	80 and 10% off
Rivets, metallic tinned, bulk.....	80 and 10% off
Rivets, tin plated, bulk.....	80 and 10% off
Rivets, metallic tinned, packages.....	80 and 10% off
Standard cap screws.....	75, 10, 10 and 7 1/2% off
Standard set screws.....	75, 10, 10 and 7 1/2% off

Shafting.—This trade does not show any improvement, the demand still being dull and only for small lots, while specifications from the large consumers are unsatisfactory. Reports are that a number of the leading automobile makers are operating at a greatly reduced rate, which accounts for the fact that specifications for shafting from this trade are much lighter than for some time. Prices continue weak. We quote cold rolled shafting at 62 to 63 per cent. off list in carloads and larger lots, and 55 to 60 per cent. off in small lots, delivered in base territory.

Hoops and Bands.—The demand is only for small lots, most consumers being covered by contracts against which specifications are quiet. We continue to quote bands at 1.30c. to 1.35c., with extras as per the steel bar card and steel hoops at 1.50c., Pittsburgh.

Wire Products.—The season in wire products is pretty well over, and the new demand is dull, being only for small lots to cover current needs or round out stocks. Specifications from jobbers are only fair. The prices of \$1.60 on wire nails and \$1.40 on plain annealed wire are not being strictly held, but are being shaded by some makers for delivery to certain points, notably in the Ohio River districts. All the wire and wire nail mills are operating at a reduced rate, and the output is lighter than for some months. We quote wire nails to jobbers \$1.60; cut nails, \$1.60; plain annealed wire, \$1.40; galvanized barb wire, \$2, and painted barb wire, \$1.60 f.o.b., Pittsburgh, per 100 lb., usual terms, actual freight added to points of delivery.

Merchant Steel.—The new demand continues dull, and only for small lots, while specifications against contracts are quiet. Prices are weak, with hardly enough new business coming out to test the market. General asking prices, which are being materially shaded on any desirable business, are as follows: Iron finished tire, 1 1/2 x 1/2 in. and larger, 1.35c., base; under 1 1/2 x 1/2 in., 1.50c.; planished tire, 1.55c.; channel tire, 3/4 to 1/2 and 1 in., 1.85c. to 1.95c.; 1 1/2 in. and larger, 1.95c.; toe calk, 1.95c. to 2.05c., base; flat sleigh shoe, 1.70c.; concave and convex, 1.75c.; cutter shoe, tapered or bent, 2.25c. to 2.35c.; spring steel, 1.95c. to 2.05c.; machinery steel, smooth finish, 1.80c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and 1 1/2 in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.25c.; soft, 3.50c.; coils, hard, 3.15c.; soft, 3.40c.; freight allowed. The usual differentials apply for lighter gauges and sizes.

Standard Pipe.—Mills report that the general demand for merchant pipe is as heavy as looked for at this season of the year, which is always the dull time in the pipe trade. The recent reduction of \$2 a ton on lap-weld steel pipe has put the market on a more stable basis, and the mills state that the new discounts are firmly held. The pipe mills are well filled with orders to the end of the year and there is no disposition to cut the market to get new business. No large gas or oil lines are being figured on, as it is too late in the season to start large pipe-laying projects. Oil country goods continue in active demand; heavy drilling is being done in the Southwest territory and will likely continue throughout the winter. Discounts in effect on iron and steel pipe are printed on a previous page.

Boiler Tubes.—A fair amount of new business is being placed, and specifications against contracts are moderate. We note, however, that regular discounts on both steel and charcoal iron boiler tubes are being shaded to jobbers one point or more.

Iron and Steel Scrap.—The scrap market continues to drag, the demands being light. Prices are again lower. An embargo has been declared at one of the prominent consuming points, but dealers report that consumers are more willing to take in scrap at the low prices ruling. Selected heavy steel scrap has been offered as low as \$11.50, and bundled sheet scrap has sold at close to \$6 at loading point, or about \$6.75, Pittsburgh. Cast-iron borings are weaker, being offered as low as \$7.25 delivered. Dealers are quoting about as follows per gross ton for delivery in the Pittsburgh and other districts:

Selected heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	\$11.50 to \$11.75
Compressed side and end sheet scrap	10.25
No. 1 foundry cast	12.00 to 12.25
No. 2 foundry cast	10.75 to 11.00
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	6.75 to 7.00
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	12.75 to 13.00
No. 1 railroad malleable stock	11.25 to 11.50
Grate bars	8.00 to 8.25
Low phosphorus melting stock	15.00 to 15.25
Iron car axles	24.25 to 24.75
Steel car axles	12.25 to 17.50
Locomotive axles, steel	20.75 to 21.25
Locomotive axles, iron	25.25 to 25.75
No. 1 busheling scrap	11.50
No. 2 busheling scrap	7.00
*Machine shop turnings	6.50
Old carwheels	13.50 to 13.75
*Cast-iron borings	7.25 to 7.50
Sheet bar crop ends	13.75 to 14.00
Old iron rails	14.25 to 14.50
No. 1 railroad wrought scrap	13.50 to 13.75
Heavy steel axle turnings	8.75 to 9.00
Stove plate	8.00 to 8.25

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.

†Shipping point.

Coke.—A serious break occurred in the price of furnace coke last week, due to a sale of 10,000 tons of standard grade at \$1.90 at oven. All efforts to hold the market at \$2.50 have been given up. The coke operator's made desperate efforts to prevent the break, shutting down a large number of ovens to restrict output, but, with a steadily declining pig iron market, they found it impossible to sell coke at \$2.50 or anywhere near that price. Best grades of furnace coke are being freely offered at \$2, while some grades not so high in quality are being offered as low as \$1.75. We quote standard makes of furnace coke at \$1.85 to \$2 and 72-hour foundry coke at \$2.75 to \$2.85 per net ton at oven. The Connellsburg *Courier* reports the output of coke last week in the Upper and Lower Connellsburg regions at 385,670 net tons, an increase over the previous week of nearly 6000 tons.

Chicago

CHICAGO, ILL., November 3, 1913.

The week has brought out few developments above the level of routine business. What is of most interest in its bearing upon prices in this market is the determination of the local mills to secure for themselves as much of the available Western business as they desire, to the exclusion of Eastern competitors. This intention is already reflected in quotations of 1.48c. Chicago for bars, plates and shapes. Prices for black and galvanized sheets are also down to the equivalent of 2c. and 3c. Pittsburgh, respectively, for No. 28 gauge. The bar iron market has shown some power of resistance in that there seems to have been no recurrence of 1.12½c., which was done in two instances. Some improvement is noted in railroad inquiry. The Illinois Central, Santa Fe and Louisville & Nashville railroads are receiving quotations, while the Burlington and St. Paul have made some purchases of track fastenings. Pig iron prices remain unchanged and with the exception of one transaction in malleable iron sales are unimportant. The scrap market shows a few additional reductions, but no important changes.

Pig Iron.—Aside from the buying of malleable iron by a Missouri company, whose inquiry for 1000 tons is understood to have been exceeded by the actual purchase, the market is devoid of interest. Inquiry and sales are confined very largely to carload lots, but it is interesting to note that shipping instructions for this

iron are urgent and positive. The general sentiment among customers indicates that buying will wait upon lower prices. The furnaces with their first half output largely unsold are not over optimistic as to the trend of the market. Prices show no change, with Southera iron selling for the most part on the basis of \$11.50, Birmingham, for No. 2 and Lake iron at \$15 f.o.b. furnace. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 1, 2, 3, 4...	\$15.25 to \$15.75
Northern coke foundry, No. 1	15.50 to 16.00
Northern coke foundry, No. 2	15.00 to 15.50
Northern coke foundry, No. 3	14.50 to 15.00
Southern coke, No. 1 foundry and No. 1 soft	16.35 to 16.85
Southern coke, No. 2 foundry and No. 2 soft	15.85 to 16.35
Southern coke, No. 3	15.35 to 15.85
Southern coke, No. 4	14.85 to 15.35
Southern gray forge	14.85 to 15.35
Southern mottled	14.35 to 14.85
Malleable Bessemer	15.00 to 15.50
Standard Bessemer	18.40
Basic	15.00 to 15.50
Jackson Co. and Kentucky silvery, 6 per cent.	18.40
Jackson Co. and Kentucky silvery, 8 per cent.	19.40
Jackson Co. and Kentucky silvery, 10 per cent.	20.40

Rails and Track Supplies.—The Chicago, Burlington & Quincy Railroad returned its formal contract for 25,000 tons of rails to the Illinois Steel Company last week, covering its purchases previously announced, and with this contract orders for its requirements of angle bars were placed. The matter of tie plates, spikes and bolts for this road remains open. The Chicago, Milwaukee & St. Paul has closed for a considerable portion of its track fastenings and is negotiating with regard to rails. Other rail inquiries have been received from the Illinois Central, the Santa Fe and the Louisville & Nashville, the latter asking for delivery at Pensacola, Fla. Lower prices have been made on track fastenings in the current negotiations and we now quote standard railroad spikes at 1.65c. to 1.70c. base; track bolts with square nuts, 2.10c. to 2.15c. base, all in carload lots, Chicago; tie plates, \$30 to \$32, net ton; standard section Bessemer rails, Chicago, 1.25c. base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—Reports concerning the activity of fabricating shops vary widely. Where a large shop in Kansas City found October to be the second month in its history both as regards tonnage and collections, probably only one Chicago shop has three months work on its books. But three contracts for fabricated steel are reported for the week, the largest of these being 2027 tons for the Lake Washington Canal lock gates at Seattle, awarded to the Penn Bridge Company. The American Bridge Company will build a car ferry for the Atchison, Topeka & Santa Fé Railway Company, calling for 317 tons, and the Minneapolis Steel & Machinery Company will furnish 223 tons for a new building for the University of Minnesota. Inquiries for cars (with some purchases variously reported) are noted as emanating from the Pere Marquette, Wabash, Chicago, Milwaukee & St. Paul, Missouri, Kansas & Texas and Soo railroads. As much as possible is being withheld concerning the actual extent of this business and it is therefore difficult to verify current reports. The Chicago Street Railways Company is understood to have ordered 100 cars from the Southern Car Company. From other sources than car building the demand for structural material is exceedingly light. Prices have felt the effect of the limited business available, and quotations as low as 1.48c., Chicago, are no longer denied. For Chicago delivery from mill we quote 1.48c. to 1.53c.

For structural shapes out of store we continue to quote for Chicago delivery 1.95c.

Plates.—During the early stages of a period of recession in prices the lowest quotations are ordinarily made in this market by some of the smaller mills in Ohio and in the Pittsburgh district. As the scarcity of business becomes more pronounced the local mills assume the position of reserving Western business for themselves sacrificing their freight advantage to do so. The past week indicates that this condition has again arisen and universal mill plates can be secured on the basis of 1.30c., Pittsburgh, where desirable tonnage is involved, and it can hardly be said that this quotation is a minimum for sheared plates. For Chicago delivery from mill we quote 1.48c.

For plates out of store we quote 1.95c.

Sheets.—With further declines in the price of sheet

bars new and corresponding concessions in black and galvanized sheets have appeared. It is now practically impossible for the mills to do better than 2.18c., Chicago, for the general run of business in No. 28 black and 3.18c. for the same gauge in galvanized. Business is only moderate, although both jobbers and manufacturers' stocks are unquestionably very low. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.73c. to 1.78c.; No. 28 black, 2.18c.; No. 28 galvanized, 3.18c.

Out of store the business in sheets continues very light. We quote without change as follows: No. 10 blue annealed, 2.15c.; No. 28 black, 2.75c.; No. 28 galvanized, 3.80c.

Bars.—Steel bar business has been purely routine and limited to specifications against contracts. The very low prices at which bar iron was sold two weeks ago seem to have been exceptional rather than representing the actual status of the market, for no evidence of their being repeated has come to light. The general market is now in the neighborhood of 1.17½c., with minimum quotations at 1.15c. We quote for mill shipment as follows: Bar iron, 1.15c. to 1.20c.; soft steel bars, 1.48c. to 1.58c.; hard steel bars, 1.40c. to 1.50c.; shafting in carloads, 60 per cent. off; less than carloads, 55 per cent. off.

For delivery from store we quote soft steel bars 1.85c.; bar iron, 1.85c.; reinforcing bars, 1.85c. base, with 5c. extra for twisting in sizes ½ in. and over, and usual card extras for smaller sizes; shafting 55 per cent. off.

Rivets and Bolts.—As in all other materials specifications for rivets and bolts, particularly from the jobbers, are limited to quantities that keep pace with sales to consumers, stocks being maintained at the lowest possible ebb. Requirements of new work are less than fair. We quote from mill as follows: Carriage bolts up to 3/8 x 6 in., rolled thread, 80-2½; cut thread, 75-17½; larger sizes, 70-15; machine bolts up to ½ x 4 in., rolled thread, 80-7½; cut thread, 80-2½; large size, 75-2½; coach screws, 80-10-10; hot pressed nuts, square head, \$6 off per cwt.; hexagon, \$6.70 off per cwt. Structural rivets, 3/4 to 1 1/4 in., 1.98c. to 2.03c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

Out of store we quote for structural rivets, 2.70c., and for boiler rivets, 2.90c. Machine bolts up to 3/8 x 4 in., 70-5-10; larger sizes, 70-7½; carriage bolts up to ½ x 6 in., 75-5; larger sizes, 70-7½ off. Hot pressed nuts, square head, \$5.50, and hexagon, \$6.20 off per cwt.

Old Material.—Despite the low level of prices, ample scrap continues available for whatever demand consumers may make upon the market. While some forms, such as country scrap, are not moving as freely, both manufacturers and the railroads are under the necessity for the most part of moving their accumulations at the best prices obtainable. Railroad offerings for the current week are light, including 3700 tons from the Atchison, Topeka & Santa Fe and a blank list from the Erie. Our quotations have been reduced slightly in a few instances, but the general market remains about as it was a week ago. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.	
Old iron rails	\$13.50 to \$14.00
Old steel rails, rerolling	12.00 to 12.50
Old steel rails, less than 3 ft.	11.25 to 11.75
Relaying rails, standard section, subject to inspection	24.00
Old carwheels	12.00 to 12.50
Heavy melting steel scrap	9.75 to 10.25
Frogs, switches and guards, cut apart	9.75 to 10.25
Shoveling steel	9.00 to 9.50
Steel axle turnings	7.00 to 7.50

Per Net Ton.	
Iron angles and splice bars	\$13.25 to \$13.75
Iron arch bars and transoms	12.50 to 13.00
Steel angle bars	9.00 to 9.50
Iron car axles	20.00 to 20.50
Steel car axles	13.75 to 14.25
No. 1 railroad wrought	9.25 to 9.75
No. 2 railroad wrought	8.50 to 9.00
Cut forge	8.50 to 9.00
Steel knuckles and couplers	9.25 to 9.75
Steel springs	9.75 to 10.25
Locomotive tires, smooth	10.75 to 11.25
Machine shop turnings	4.50 to 4.75
Cast borings	4.50 to 5.00
No. 1 busheling	7.75 to 8.25
No. 2 busheling	6.25 to 6.75
No. 1 boilers, cut to sheets and rings	7.00 to 7.50
Boiler punchings	10.25 to 10.75
No. 1 cast scrap	10.25 to 10.75
Stove plate and light cast scrap	9.25 to 9.75
Railroad malleable	9.50 to 10.00
Agricultural malleable	8.75 to 9.25
Pipes and flues	7.00 to 7.50

Wire Products.—Although a measure of stability has come to the market with a reduction of prices to the basis of \$1.60, Pittsburgh, for nails, these lower quo-

tations have failed to bring out any large amount of business. Specifications indicate that both jobbers and retailers are doing a hand-to-mouth business. Prices to jobbers are as follows: Plain wire, No. 9 and coarser, base, \$1.58; wire nails, \$1.78; painted barb wire, \$1.78; galvanized, \$2.15; polished staples, \$1.78; galvanized, \$2.10, all Chicago.

Cast-Iron Pipe.—The only municipal award of the past week was for 150 tons at Oxford, Kansas. A somewhat better showing has been made in routine business of which a fair aggregate tonnage is reported. We quote as follows, per net ton, Chicago: Water pipe, 4-in., \$28; 6 to 12-in., \$26; 16-in. and up, \$25, with \$1 extra for gas pipe.

Philadelphia

PHILADELPHIA, PA., November 4, 1913.

Confronted with gradually weakening markets, consumers continue to make purchases very conservatively. Forward buying is largely deferred, awaiting developments. Foundry iron sales have been light, but prices have receded 25c. a ton. Basic has been sold for this year's delivery at \$15. Forge is also lower, while standard low phosphorus has a decidedly weaker appearance, due to possible importations of that grade. Buyers of finished materials are awaiting the establishment of a stable price level. Reports of prices under recent quotations continue to be heard. Railroad buying promises to become more active. Mill operations continue to recede. The coke market is weak, with some forward inquiry for furnace grades. In old material a number of the leading grades are practically uncalled for.

Iron Ore.—Consumers show no interest in the market. Importations during the week ended October 30 included 3000 tons from Venezuela and 6250 tons from Cuba.

Pig Iron.—Prices have been gradually working toward a lower level. While some producers still refuse to make concessions from the basis of \$16, delivered, for standard brands of No. 2 X foundry iron, sales are being made at \$15.75 and in instances, particularly for less desirable brands, this has been shaded. In fact, all grades exhibit an easier tendency. Sales have been confined to small lots, one sizeable inquiry, 1500 tons, being divided among several producers. In this transaction a portion of the iron was for delivery over the first quarter of next year and part was taken by one seller at \$15.75 for No. 2 X, both for this year and first quarter delivery. This may be taken to indicate that no higher prices for first quarter, at least, will be obtainable. As a rule, consumers are not putting out inquiries for 1914 requirements but purchase odd lots for early shipment and are awaiting developments. Cast-iron pipe makers are still in the market for good tonnages. One Delaware River interest continues to buy odd lots, prices of which range from \$14.75 to \$15, delivered, while another interest has just put out an inquiry for 6000 tons, half gray forge and half No. 3 foundry, for delivery in January and February. Talk of importation of Middlesbrough No. 3 foundry is still heard, but business can not be profitably done at present prices. Cargo lot buyers are comparatively scarce. The movement in Virginia foundry grades has been light. The leading interest has withdrawn from its position of holding at \$13.25 at furnace for this year's delivery. While the demand for rolling mill forge iron has not been active, there has been some small lot movement, particularly to the central part of the State, at prices which represent \$14.75 to \$15, delivered in this immediate vicinity. The demand for steel making grades has been irregular. Negotiations are still pending against an inquiry for 1500 tons of Bessemer for an Eastern consumer. Upward of 1000 tons of basic pig has been sold for this year's shipment at \$15 delivered, representing a decline of 25c. from recent sales. Prospective business in basic is light. A sale of 1000 tons and one of 200 tons of Lebanon Valley low phosphorus have been made at \$18 at furnace. Standard low phosphorus pig has been quiet, but inquiries would no doubt bring out lower prices, as readjustments are said to be under way. Interest is being taken in the possible importation of British hematite, in competition with domestic low phosphorus, it being stated that this grade could be brought in at about \$21.50 on dock here. Extras and freights would probably add \$1.50 to this price, for delivery in this vicinity. While deliveries on all grades of pig iron are being freely taken, and stocks on furnace yards are being reduced, prices are nevertheless inclined to

be weak. The following range is named for standard brands, delivered in buyers' yards in this vicinity:

Eastern Pennsylvania No. 2 X foundry.....	\$15.75 to \$16.00
Eastern Pennsylvania No. 2 plain.....	15.50 to 15.75
Virginia No. 2 X foundry	15.80 to 16.00
Virginia No. 2 plain.....	15.55 to 15.75
Gray forge	14.75 to 15.00
Basic	15.00 to 15.25
Standard low phosphorus (nominal).....	23.00 to 23.50

Ferroalloys.—There has been little inquiry for ferromanganese. The demand seldom exceeds 100-ton lots. English 80 per cent. ferromanganese appears firm at \$50, seaboard, while German sells at \$49 to \$49.50, and reports are heard that these prices have been shaded. There is still an absence of any demand for forward delivery. Importations of ferromanganese at this port last week aggregated 402 tons. Little demand for ferrosilicon is in evidence.

Billets.—The demand has been very light. Sales have been confined to small lots, on which prices for basic open-hearth rolling billets have dropped to \$24.40, delivered in this district. Makers state that any desirable business would easily bring out prices \$1 under this figure. Mill operations, which have been at about two-thirds capacity, promise further reduction. Specifications on contracts are lighter. Forging billets are comparatively inactive and are nominally quoted at \$29.40 for ordinary analysis steel, delivered in this district.

Plates.—Price uncertainties are having a considerable bearing on the situation. Orders for current odd lots have been smaller, consumers awaiting the establishment of some definite price level. The scarcity of universal mill work is still in evidence. It is freely stated that 1.45c. here has been done on tonnage business. Makers do not seem to have any established basis, making quotations on the nature of the business and the desirability of the order.

Structural Material.—Shapes appear even weaker than plates. Current miscellaneous business is lighter and competition is sharper. On small lots down to 1.45c., delivered here, has been done, although efforts are made to hold to 1.50c. Some moderate business in angle bars has been closed at the latter figure. The bridge over the Potomac for the Baltimore & Ohio Railroad, 2500 tons, is reported to have been placed with the leading interest. Inquiries for 17,000 tons of tie plates for railroad work are before the trade. Plans for the elimination of grade crossings on Lehigh avenue, for the Pennsylvania Railroad, are under way. Mill operations in this district now represent about 75 per cent. of capacity, and the immediate outlook is not encouraging. Quotations are irregular, ranging from 1.45c. to 1.50c. for plain shapes, delivered in this district.

Sheets.—Eastern mills have been receiving a better volume of business and for the most part ran at full capacity last week. Business, however, has been of the hand-to-mouth variety and mill order books have but little forward business. Prices are easy, ranging from 1.65c. to 1.75c., delivered here, for No. 10 blue annealed sheets.

Bars.—Both iron and steel bars have been in small demand, consumers purchasing only against current needs. Mills are less fully engaged, and while business offered has not been of sufficient volume to test the market, small lots of ordinary iron bars are moving at 1.32½c. to 1.37½c., delivered, but are considered weak. Steel bars are quiet, with prices weak.

Coke.—Some interest is being shown in forward furnace coke, one consumer negotiating for 8000 tons a month for the first half of next year and expects to place the business at close to \$2 at oven. Furnace coke for near future delivery has been sold at \$1.90 at oven. The market for forward furnace coke appears to range from \$2 to \$2.25, according to grade. In foundry coke, light business continues to be done at \$3 to \$3.15 at oven. For delivery in buyers' yards in this district the following range of prices, per net ton, is named:

Connellsburg furnace coke	\$4.05 to \$4.40
Connellsburg foundry coke	4.90 to 5.35
Mountain furnace coke	3.85 to 4.10
Mountain foundry coke	4.60 to 4.85

Old Material.—Mills show even less interest in the market, and the bulk of the sales have been between dealers, on business applying on old contracts. Heavy melting steel has sold down to \$10.50, delivered, although brokers pay higher prices for shipments against old higher-priced orders. Rolling mill grades are uncalled for. Turnings and borings can scarcely be moved. A sale of a round lot of rerolling rails is re-

ported at \$13.50, delivered. Sellers find it almost impossible to get buyers interested, even at price concessions. Prices continue to move downward, even on small lots. The following range about represents the market, at which business might be done, for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates varying from 35c. to \$1.35 per gross ton:

No. 1 heavy melting steel	\$10.50 to \$10.75
Old steel rails, rerolling (nominal)	13.50 to 14.00
Low phosphorus heavy melting steel scrap (nominal)	15.00 to 15.50
Old steel axles	17.00 to 17.50
Old iron axles (nominal)	23.00
Old iron rails	17.50 to 18.00
Old carwheels	12.00 to 12.50
No. 1 railroad wrought	13.00 to 13.50
Wrought-iron pipe	9.50 to 10.00
No. 1 forge fire	8.00 to 8.50
No. 2 light iron (nominal)	5.00
No. 2 heating (nominal)	7.50 to 8.00
Wrought turnings	7.00 to 7.50
Cast borings	7.50 to 8.00
Machinery cast	13.00 to 13.50
Grate bars, railroad	9.00 to 9.50
Stove plate	9.50 to 10.00
Railroad malleable (nominal)	11.00 to 11.50

Cleveland

CLEVELAND, OHIO, November 4, 1913.

Iron Ore.—Lake ore shipments will fall considerably short of 50,000,000 tons, but will exceed those of 1912. The total lake movement for the season is expected to be between 48,000,000 and 49,000,000 tons and will probably be near the latter figure. Shipments in October were 6,521,884 tons, a loss of 488,335 tons as compared with October a year ago. Lake shipments for the season to November 1 aggregated 45,787,368 tons. This is an increase of 2,438,767 tons over the same period last year. The November movement last year amounted to 4,072,674 tons, but shipments for November this year are expected to be considerably less than they were in November a year ago. Ore firms are rapidly cleaning up on shipments and the movement will be very light after next week. However some ore will be shipped out of Escanaba until December 1. The Pittsburgh Steamship Company will not load outside vessels after November 13. We quote prices as follows: Old range Bessemer, \$4.40; Mesaba Bessemer, \$4.15; old range non-Bessemer, \$3.50; Mesaba non-Bessemer, \$3.40.

Pig Iron.—The market is somewhat more active, this being apparently due to an aggressive policy that seems to have been adopted by some of the furnace companies to take on tonnage. While furnaces are well sold up for the remainder of the year few orders have been booked for delivery after January 1. The market is weak and lower prices are being named on all grades. Valley foundry iron has been offered in Cleveland at \$13.60 at furnace for No. 2 and local furnaces have reduced their price to \$14.50, delivered, and it is possible that this price can be shaded, although there has been no local business to test the market. At least one of the lake furnaces has become a competitor of southern Ohio furnaces in the central part of the State and is reported to be making sales in that territory on the basis of \$13.50 or under for No. 2. The sale of a small lot of basic is reported by Valley furnace at below \$13.50. Bessemer iron is normally \$15.50 and malleable Bessemer is down to \$14. The only large foundry inquiry pending is from an Elyria consumer for 2000 to 3000 tons for the first half. The N. & G. Taylor Company, Philadelphia, has an inquiry out for 1000 tons of basic for delivery over five months. There is little activity in southern iron, although a few early shipment sales have been made at \$11, Birmingham. For first half delivery Southern iron is quoted at \$11.50. Two Valley furnaces have blown out since November 1, one of these going out for lack of orders. Unless conditions improve others will probably blow out before the end of the year. For prompt shipment and delivery until January 1 we quote delivered Cleveland as follows:

Bessemer	\$16.40
Basic	14.40
Northern No. 2 foundry	14.50
Southern No. 2 foundry	\$15.35 to 15.85
Gray forge	14.00
Jackson County silvery, 8 per cent. silicon	18.55

Coke.—The market is dull and prices are weaker. Furnace coke is being freely offered at \$1.90 per net ton at oven and some tonnage has been sold at that price for November delivery. For delivery over the remainder of the year standard Connellsburg foundry coke is quoted at \$2.75 to \$3.

Finished Iron and Steel.—The demand in finished lines shows a slight improvement, but orders are mostly for small lots and for immediate delivery. Prices are weak and lower. The demand for plates shows more improvement than other lines, but plate prices are particularly weak. While plates are generally quoted at 1.30c., Pittsburgh, a 1.25c. quotation is being made and a desirable inquiry might bring out a lower price. Steel bars are quoted at 1.35c., and there are unconfirmed reports that this price is being shaded. The general quotation on structural material is 1.35c., but any desirable order will bring out a lower price. In spite of the lower prevailing prices the leading interest is adhering in this market to 1.40c. for steel bars, 1.35c. for shapes and 1.30c. for plates. Bar iron is weaker, local mills having reduced their quotations to 1.30c. The demand is light and one of the local mills is shut down. The local sales agency of a Chicago mill that has been particularly active in the bar iron market announces that its minimum quotation is now 1.20c. Some sales were recently reported at lower prices. The structural situation is quiet. While some work is being figured on no new inquiries have come out. The demand for sheets is not active, but the bottom has apparently been reached at 2c. for No. 28 black and 3c. for No. 28 galvanized. Rivet prices are not firm and the usual quotation of 1.80c. for structural and 1.90c. for boiler are being shaded \$1 a ton. Cleveland warehouse prices have been reduced \$2 a ton to 1.90c. for steel bars and 2c. for plates and structural material.

Old Material.—Quotations on several grades have further declined in spite of the extremely low prices now prevailing. Some of the dealers believe that the bottom has not yet been reached. Few sales are reported. Mills are buying only in small lots for immediate requirements. A local mill has taken some heavy steel scrap at \$10. Another Cleveland consumer is offering \$8.50 for busheling scrap. The Erie Railroad and the Pennsylvania Lines have their usual monthly lists out, which will close this week. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton.

Old steel rails, rerolling	\$12.00 to \$12.50
Old iron rails	12.50 to 13.00
Steel car axles	16.50 to 17.00
Heavy melting steel	10.00 to 10.25
Old carwheels	12.00 to 12.50
Relaying rails, 50 lb. and over	23.00 to 25.00
Agricultural, malleable	9.00 to 9.50
Railroad, malleable	11.00 to 11.50
Light bundled sheet scrap	6.50 to 7.00
Bundled tin scrap	11.00 to 11.50

Per Net Ton.

Iron car axles	\$20.00 to \$21.00
Cast borings	5.50 to 5.75
Iron and steel turnings and drillings	4.25 to 4.50
Steel axle turnings	5.75 to 6.00
No. 1 busheling	8.50 to 9.00
No. 1 railroad wrought	10.00 to 10.50
No. 1 cast	11.00 to 11.25
Stove plate	8.00 to 8.50

Cincinnati

CINCINNATI, OHIO, November 5, 1913.—(By Telegraph.)

Pig Iron.—Melters in this territory are disposed to hold off buying for next year's requirements. Those who have not already covered for first and second quarter needs are simply awaiting developments, and several leading iron merchants predict that only hand-to-mouth business will be done during the present month. Both Northern and Southern prices were weak. While it is pretty generally known that Standard No. 2 foundry can be bought for this year's shipment below \$14, Ironton, and \$11, Birmingham basis, present business is too light to warrant a change in quotations. However, it can be stated that in the majority of instances, where reductions are made in the above mentioned quotations, the small amount involved would indicate that sellers are willing to divide their commissions in order to retain old customers. Practically all of the inquiries mentioned last week are yet unclosed, and there is a new one from northern Indiana for 500 tons each of Northern and Southern foundry iron for first half shipment. A small number of sales have been made in this immediate territory for delivery this year, and in a few instances \$11.50, Birmingham, was obtained. Competition from Lake furnaces is still a factor to be reckoned with in central Ohio, but, in spite of the lower prices named, no large business has been booked. Malleable is dull and unchanged around \$14, Ironton, and this same figure can be inserted in contracts for first quarter shipment for either malleable or No. 2 foundry. There is no demand for basic, as all users in

this territory have covered for nearby requirements. Based on freight rates of \$3.25 from Birmingham and \$1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry and 1 soft	\$14.75 to \$15.25
Southern coke, No. 2 foundry and 2 soft	14.25 to 14.75
Southern coke, No. 3 foundry	13.75 to 14.25
Southern, No. 4 foundry	13.25 to 13.75
Southern gray forge	12.75 to 13.25
Ohio silvery, 8 per cent. silicon	18.20 to 18.70
Southern Ohio coke, No. 1	16.20 to 16.70
Southern Ohio coke, No. 2	15.20 to 15.70
Southern Ohio coke, No. 3	14.95 to 15.45
Southern Ohio malleable Bessemer	15.20 to 15.45
Basic, Northern	15.20 to 15.45
Lake Superior charcoal	16.25 to 17.25
Standard Southern carwheel	27.25 to 27.75

(By Mail)

Coke.—Connellsville prices are unsteady, and a reported sale of furnace coke below \$2 per net ton at oven has now been confirmed. However, this was for nearby shipment, and contract quotations range all the way from \$2 to \$2.40. Foundry coke has weakened in sympathy with furnace grades, and as low as \$2.50 can be done for prompt shipment, with contract prices averaging about 25c. a ton higher. There is little foundry coke being bought, although specifications on contracts previously made are said to be satisfactory. In the Wise County and Pocahontas fields the price situation is somewhat better, and it is doubtful if anything below \$2.25 is being quoted on prompt 48-hr. coke, and around \$2.75 to \$3 for 72-hr. brands. A scarcity of cars is causing some embarrassment in all three districts.

Finished Material.—Although mill prices have declined on both steel bars and structural shapes, local warehouse quotations are steady around 1.90c. for the former and 2c. for the latter. Warehouse business is said to be better than was anticipated when the market began to weaken. Open weather conditions have facilitated building operations, and there is a fair demand for twisted reinforcing concrete bars, as well as small structural shapes. One mill agency reports railroad inquiry on the mend. While no extensive buying is expected from this source this year, indications point to a better business in the remainder of the present month.

Old Material.—Prices are as weak as they have been for the past fortnight. Yard stocks are large, and there is a declining demand from almost all melters of scrap. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices f.o.b. at yards:

Per Gross Ton.

Bundled sheet scrap	\$7.00 to \$7.50
Old iron rails	12.00 to 12.50
Relaying rails, 50 lb. and up	19.75 to 20.25
Rerolling steel rails	11.00 to 11.50
Melting steel rails	9.50 to 10.00
Old carwheels	10.75 to 11.25

Per Net Ton.

No. 1 railroad wrought	\$9.00 to \$9.50
Cast borings	4.50 to 5.00
Steel turnings	4.50 to 5.00
No. 1 cast scrap	9.00 to 9.50
Burnt scrap	6.50 to 7.00
Old iron axles	16.75 to 17.25
Locomotive tires (smooth inside)	10.25 to 10.75
Fires and flues	6.00 to 6.50
Malleable and steel scrap	7.50 to 8.00
Railroad tank and sheet scrap	4.75 to 5.25

Birmingham

BIRMINGHAM, ALA., November 3, 1913.

Pig Iron.—The Southern pig iron trade is in a waiting attitude, with scattering sales of special iron to fill in where the scarcity of Nos. 1 and 2 soft is felt. In such instances the full market price is obtained. There is little inquiry. Consumers are well supplied for the rest of the year and do not feel inclined to interpret the future, while makers are well sold for the same period and are likewise unwilling to figure on what the price will be for 1914. Dealers agree with the makers as to the market basis and conditions. Some of them have placed numbers of small orders of special iron as a substitute for No. 2 soft and report the uniform basis of \$11.50. All the bookings were for spot shipment. Some special analysis iron sold as high as \$12.25. A small amount of charcoal iron has been sold at \$23.50 to \$24. The Clifton brand of high silicon iron is booked for two months ahead at \$1 to \$1.50 above the regular market. There is no report of price concessions in any quarter, or of inquiry for any large tonnage at less than market

price. The foundry market has not been affected by any change in operation of furnaces of the leading interest, apprehension of which was reported in some quarters. That company has not changed any furnaces from basic and is operating the rail mill at Ensley several days a week with the hope and, it is believed, the prospect of being able to continue the plant in operation until the holidays. We quote, per gross ton, f.o.b. Birmingham district furnaces (the highest price being obtained only in special instances), as follows:

No. 1 foundry and soft	\$12.00 to \$12.25
No. 2 foundry and soft	11.50 to 11.75
No. 3 foundry	11.00 to 11.25
No. 4 foundry	10.50 to 10.75
Gray forge	10.25 to 10.50
Basic	11.00 to 11.50
Charcoal	23.50 to 24.00

Cast-Iron Pipe—Manufacturers of water pipe again report running the shops on short time, but with a sufficiency of small orders to keep them going at that rate. Soil pipe manufacturers report quite a disposition to curtail operations, owing to conditions in the trade. We quote, f.o.b. pipe shops as follows, per net ton: 4-in., \$22; 6-in. and upward, \$20, with \$1 added for gas pipe.

Coal and Coke—Coal has not shown any recovery from the comparative dullness existing in the steam coal trade. The mines are seeking customers and a number of collieries are reported as working on short time. The demand for domestic coal of high grades is excellent and prices tend to rise. Coke has recovered its strength and is now sold at former high prices. The market is being sounded by the smelter trade in Arizona and Nevada, owing to the spread of the strike fever in that section, but no orders are reported booked. We quote, per net ton, f.o.b. oven as follows: Furnace coke, \$2.75 to \$3; foundry, \$3.75 to \$4.25.

Old Material—The market is excessively dull. Any promise of business would bring forth lower prices, but for the present quotations are continued, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles	\$15.00 to \$15.50
Old steel axles	15.00 to 15.50
Old iron rails	12.50 to 13.50
No. 1 railroad wrought	11.00 to 11.50
No. 2 railroad wrought	9.50 to 10.00
No. 1 country wrought	9.50 to 10.00
No. 2 country wrought	8.50 to 9.00
No. 1 machinery cast	10.50 to 11.00
No. 1 steel scrap	10.50 to 11.00
Tram carwheels	10.50 to 11.00
Standard carwheels	12.00 to 12.50
Light cast and stove plates	9.00 to 9.50

Inquiry for British Rails for America

Steel Bars and Pig Iron Lower—American Competition for Canadian Orders Acute

(By Cable)

LONDON, ENGLAND, November 5, 1913.

The general position is unchanged, with a dull tone and easing in price tendencies. There is no improvement in the pig-iron situation but warrant stocks are 159,371 tons against 164,450 tons one week ago. Tin plate is slightly better but American competition for Canadian orders is acute. There is an inquiry for 3000 tons of rails for shipment to Savannah. We quote as follows, without change from last week:

Tin plates, cokes, 14 x 20, 112 sheets, 108 lb. f.o.b. Wales, 12s. 10½d. (\$3.13).

(The following prices are per ton of 2240 lb.)

Cleveland pig-iron warrants (Tuesday), 50s. 8½d. (\$12.32) against 51s. 9½d. (\$12.59) one week ago.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 51s. 3d. (\$12.46) against 52s. 3d. (\$12.71) one week ago.

Ferromanganese, £9 17s. 3d. (\$48).

Steel sheet bars (Welsh), delivered at works in Swansea Valley, £4 15s. (\$23.11).

Steel bars, export, f.o.b. Clyde, £6 5s. (\$30.48), a decline of 2s. 6d.

Steel joists, 15-in., export f.o.b. Hull or Grimsby, £5 17s. 6d. (\$28.59).

Steel ship plates, Scotch, delivered local yards, £7 7s. 6d. (\$35.89).

Steel black sheets, No. 28, export f.o.b. Liverpool, £9 (\$43.79).

Steel rails, export, f.o.b. works port, £6 7s. 6d. (\$31.02). (The following prices are per export ton of 1015 kilos, equivalent to 2237.669 lb.):

German sheet bars, f.o.b. Antwerp, 85s. (\$20.69).

German 2-in. billets, f.o.b. Antwerp, 80s. (\$19.46).

German basic steel bars, f.o.b. Antwerp, £4 10s. (\$21.89).

German joists, f.o.b. Antwerp, £5 5s. to £5 8s. (\$25.55 to \$26.28).

German Prices Still Falling

Trade Conditions More Discouraging—State Railroads Withhold Rail Orders

BERLIN, October 24, 1913.

No signs of improvement are seen anywhere, but in some important branches still further depreciation in volume of business is reported, with further drops in prices. This applies chiefly to products not protected by trade organizations. At a meeting of the Steel Works Union this week it was reported that the position of beams is weak but that the export demand for semi-finished steel is slightly better. Basic steel bars are now sold by some makers as low as 92 to 93 marks (\$21.90 to \$22.13), but mills in a relatively strong position demand several marks more, with prices for extra-fine grades ranging upward to 100 marks (\$23.80).

Iron ore under contract is being called for delivery at the normal rate. The Ore Association of the Siegerland region, which terminates at the end of next June, has just been renewed for a further period of five years. Some supplementary buying of pig iron is still reported, but business is very quiet. While consumption is still almost as great as production, it is doubted whether the Pig Iron Syndicate will long continue able to market the present large output of the furnaces. It will begin at the end of this week to take orders for 1914 delivery. Scrap prices are further falling.

The Rail Situation Losing Its Strength

The amount of work on hand in rails, which is still large owing to the heavy orders of the various state railroad systems of Germany, has latterly been somewhat reduced through smaller bookings for export. However, some reports in circulation to the effect that the home government railroads are planning to retard specifications on orders already given has caused uneasiness in the trade. Business in rails for mines is diminishing, but grooved rails are still in good demand.

Buyers of bars are trying to make engagements for the whole of 1914 at present prices, but the mills are rejecting such offers, believing that prices can go no lower and may even improve a little later. Specifications on orders are coming in more slowly and the mills are making shipments with remarkable promptness after receiving specifications. In the export trade lighter buying is reported; South American countries, in particular, are taking less than previously. Export prices are still quoted at 88 to 89 marks (\$21.42 to \$21.66), f.o.b. Antwerp.

Plates, Tubes and Other Products in Bad Shape

The plate trade is demoralized, prices being weak despite the larger takings of the shipyards. Heavy plates can now be bought as low as 100 marks (\$23.80), but mills in a good position are demanding 103 to 105 marks (\$24.51 to \$24.98). There has been some talk recently of trying to organize the heavy plate mills, but nothing tangible has resulted, and no result is expected. As home consumption is not nearly great enough to absorb the increased production coming on the market, the mills are competing sharply for foreign business. Thin plates, after having shown more activity several weeks ago, are again dull, and the orders in hand are shrinking.

The competition in tubing continues and prices have further declined 5 to 10 marks (\$1.19 to \$2.38) per ton. The railroad authorities have just opened bids on gas piping, which showed prices ranging between 72 and 76 pfennigs (17c. and 18c.) per running meter. These prices compare with 103 pfennigs (25c.) for last April. The position of bands, wire rods, and other finer products has continued to grow worse.

Belgian prices continue to give way. The Comptoir has just reduced beams for shipment to England, Sweden, Norway, China and Japan by 3s. (73c.). The reduction, it is said, is aimed at English competition. A dispatch of today's date reports a reduction in the home price of beams of 7.50 francs (\$1.45) to 157.50 francs (\$30.40). Market reviews describe the general situation in Belgium as very bad, there having been a heavy depreciation within the past few weeks.

Iron and Steel Prices

The Koelnische Zeitung of October 17 gives the following quotations per metric ton:

	Marks	
Pig Iron:		
Spiegelisen (Siegen)	79	(\$18.80)
High-grade pudding (Siegen)	66	(\$15.71)
Hematite (Siegen)	79.50	(\$18.92)
Foundry No. 1 (Siegen)	75.50	(\$17.87)
Foundry No. 3 (Siegen)	71.50	(\$17.02)
Foundry No. 3 (Luxemburg)	63	(\$14.99)
Pudding (Luxemburg)	60	(\$14.28)
Semi-Finished Steel:		
Ingots	82.50	(\$19.63)
Bloms	87.50	(\$20.82)
Billets	95	(\$22.61)
Slabs	97.50	(\$23.20)
For open-hearth steel, prices are 5 marks (\$1.19) above these.		

Foreign Prices:	Per Gross Ton.
Billets, f.o.b. Antwerp	78 to 80 (\$18.56 to \$19.04)
Slabs, f.o.b. Antwerp	85 (\$20.23)

Finished and General Products:	Per Net Ton.
Bars (home)	92 to 100 (\$21.90 to \$23.80)
Bars (export)	90 (\$21.42)
Iron bars (home)	138 (\$32.84)
Rivet bars	158 (\$37.60)
Beams, basic (home)	120 (\$28.56)
Beams (at Dierdenhofen)	110 (\$26.18)
Plates, heavy	102 to 104 (\$24.28 to \$24.75)
Plates, medium	105 to 107 (\$24.99 to \$25.47)
Plates, thin	115 to 116 (\$27.37 to \$27.61)
Heavy plates for export (at works)	100* (\$23.80)
Wire rods (home)	117.50 (\$27.85)
Drawn wire	132.50* (\$30.54)
Wire nails, 12.50 (\$2.98) per metr. cwt.	

*And lower.

St. Louis

ST. LOUIS, Mo., November 3, 1913.

New buying is all of the hand-to-mouth type accompanied by urgent demand for early shipment, with some delays on account of car shortage, the result of crop movement. Prices are weakening pretty generally, but the shading is confined to competitive concessions rather than open figures.

Pig Iron.—Melters are practically all confining purchases to immediate needs. The largest order of the past week, for 2000 tons of malleable, was of this class, as it came from a concern which uses this quantity about every two months. Other sales were for small amounts. The impression is prevalent among furnace representatives that the melters will do their best to keep from buying until after the first of the year. While No. 2 Southern, Birmingham basis, is quoted at \$11.50, there is no doubt that \$11.25 and perhaps \$11 could be obtained if the competition were keen. There was something of a flurry over a report of \$10.75 iron in the local market, but investigation showed it to be an offering of an iron, the analysis of which was a little better than No. 3, but which could not really be counted as No. 2. Ohio iron, Ironton basis, is \$13.75 for No. 2 and Chicago No. 2 X stands at \$15, but with not enough doing to really make a market.

Coke.—There has been an easing off of the figures from recent quotations, so far as furnace grades are concerned, and even foundry has been less stiffly held. An inquiry for 10,000 tons of furnace coke caused some little excitement, but before the representatives had a fair chance to consider what they would do, it was withdrawn. By-product coke quotations are being made on the Connellsville basis.

Finished Iron and Steel.—There has been a slight weakening in structural material and plates, the recession being about \$1 per ton. There might be further trimming if the order were really worth going after. As matters stand now 1.30c. is perhaps the very best figure obtainable, though this is not easily conceded, especially from the largest interest, which is meeting competition only as it seems really worth while to do so, rather than cutting on all transactions. Steel bars are in fairly good request, though in small lots, the largest order of the week being one for about 350 tons of reinforcing for the Terminal Arcade at Kansas City. The structural shops are buying their material only as actually needed, yet they are really busy and quite a good deal of work is known to be on the way out. Ordinary bars are quiet. Nothing appeared in the local market in standard section steel rails. Light rails are in fair request from the coal interests, with lumber men still out of it. Track fastenings have also been quiet.

Old Material.—The mills and foundries are refusing, still, to take any scrap, even on contracts, and dealers are being compelled to pile it up in their yards in some instances to await the pleasure of the purchasers, inci-

dently swallowing the interest charges while doing so. To cap the climax the railroads are coming out with heavy lists which serve still further to depress the market. The Atchison, Topeka & Santa Fe is offering 4500 tons; the Missouri Pacific, 1400; the Mobile & Ohio, 700; the Kansas City Southern, 200, and the Wabash 1500 tons, with still a number of others to hear from. While we quote dealers' prices, f.o.b. St. Louis, in the following table, it is probable that every St. Louis dealer would hide from any one undertaking to do business on the basis of the figures given. As a matter of fact there is no business at all and no figures would of themselves represent the situation:

Per Gross Ton.	Per Net Ton.
Old iron rails	\$11.00 to \$11.50
Old steel rails, rerolling	11.50 to 12.00
Old steel rails, less than 3 feet	10.00 to 10.25
Relaying rails, standard section, subject to inspection	22.50 to 23.00
Old car wheels	10.00 to 10.50
Heavy melting steel scrap	9.75 to 10.25
Shoveling steel	8.50 to 9.00
Frogs, switches and guards cut apart	9.75 to 10.25
Per Net Ton.	Per Net Ton.
Iron angle bars	\$10.00 to \$10.50
Steel angle bars	8.50 to 9.00
Iron car axles	17.00 to 17.50
Steel car axles	13.00 to 13.50
Wrought arch bars and transoms	12.00 to 12.50
No. 1 railroad wrought	9.00 to 9.50
No. 2 railroad wrought	8.00 to 8.50
Railroad springs	8.50 to 9.00
Steel couplers and knuckles	8.50 to 9.00
Locomotive tires, smooth	9.50 to 10.00
No. 1 dealers' forge	7.50 to 8.00
Mixed borings	3.00 to 3.50
No. 1 busheling	8.00 to 8.50
No. 1 boilers, cut to sheets and rings	5.00 to 5.50
No. 1 cast scrap	9.00 to 9.50
Stove plate and light cast scrap	7.50 to 8.00
Railroad malleable	7.50 to 8.00
Agricultural malleable	6.50 to 7.00
Pipes and flues	5.50 to 6.00
Railroad sheet and tank scrap	5.50 to 6.00
Railroad grate bars	6.00 to 6.50
Machine shop turnings	4.50 to 5.00
Bundled sheet scrap	4.00 to 4.50

San Francisco

SAN FRANCISCO, Cal., October 28, 1913.

The market is still unsettled, with indications that considerable time may elapse before a firm basis can be reached. So far, those who handle foreign accounts appear to have made no great headway, except with bars, on which very attractive prices have been made, and importations of which have proved satisfactory in the past. Some important concessions in prices have been made by Eastern mills, and there is anticipation of still further price revision, either to meet foreign competition or in conformity with the prevailing tendency in manufacturing centers; while matters are further complicated by the prospect of freight changes on the completion of the Panama Canal. Local buyers are accordingly holding off as much as possible, though stocks are said to be lighter than for years. It is now too near the inventory season to expect any heavy buying, unless some altogether unexpected condition should develop before the end of the year. The distributive movement is only moderately active, jobbing prices in several lines being lower, and manufacturers' requirements are hardly up to expectations.

Bars.—Importers' quotations show a rather wide range, merchants have placed orders for German bars amounting to several thousand tons at 1.50c., which is believed to be the lowest figure obtainable. The closest competitive figure so far made by Eastern mills is 1.75c., on wharf, which has failed to attract much business. The foreign material is not expected to arrive for about three months, and meanwhile stocks, which are extremely low, are being maintained by frequent small purchases for immediate delivery. There is apparently little expectation of further concessions on the part of American mills, though local buyers would prefer domestic material at anything like equal prices, and well appreciate the need for discrimination in placing foreign orders. The jobbing movement is fair in some quarters, but on the whole is hardly normal. The demand for reinforcing bars keeps up well, and local mills, which have reduced their price to about 2c., report a fair tonnage in small lots. These mills will derive some advantage from the removal of the tariff on pig iron, and hope to get cheaper scrap from the Atlantic coast on completion of the Panama Canal. Soft steel bars, in jobbing lots from store, are quoted at 2.25c., and iron at 2.15c.

Structural Material.—Fabricating business has been extremely quiet, with no new contracts worth mentioning, though some inquiries are coming out. New

bids will soon be taken on the local Labor Temple, and plans are under way for a new Grauman Theater on Market street, while figures are now being taken on the addition to the Metropolitan Life Insurance building, about 200 tons, and a seven-story building at Sixteenth and Clay streets, Oakland. The Hobart building is still undecided. Bids will be taken November 17 for a steel shed on the Los Angeles municipal wharf. It is reported that a new Pantages Theater will be built at Seattle, Wash., and plans are under way for a six-story building at Front and Broadway, San Diego. The outlook for prices on plain material is rather uncertain. Some fabricators had a fair tonnage of foreign material in bond on the passage of the tariff bill, and some new business has been placed with importers since, though most buyers are awaiting further developments. Various prices are reported, a range of 1.70c. to 1.75c. being offered by importers, and about 2c. in large lots, from local warehouse, by some Eastern interests; but quotations for shipment from American mills are not well established.

Rails—Nothing definite has developed as to the effect of the new tariff on local rail business. Increased importation of light rails is expected, but stocks of this material are now uncomfortably heavy, and are not moving. Inquiries for standard sections are somewhat more numerous, and a fair tonnage has been booked. Many buyers, however, are offering securities in payment, which sellers are reluctant to accept.

Plates—Values are unsettled, mill agents being still in doubt as to what prices to quote for shipment, though tank steel from warehouse is offered at 2c. for large lots. Importers are said to have made a figure of 1.65c. on the Los Angeles aqueduct requirement, without, as far as is known here, getting the business. Merchants and manufacturers show some hesitation about buying foreign material, as former experience with imported plates has not been altogether satisfactory. Merchants are not disposed to increase their stocks at present, but there is a very good tonnage in prospect for miscellaneous tank and pipe work. Jobbers quote tank plates, from store, at 2.40c.

Sheets—Prices have dropped again within the last fortnight, and there are still reports of price-cutting on the part of the smaller mills. Local jobbing prices also have declined. The apparent weakness of the market, together with the customary reluctance to buy at this time of the year, keeps orders down to narrow limits, stocks being exceptionally light. If the expected stiffening of prices takes place about the first of the year, a heavy movement will doubtless follow.

Standard Pipe—The National Tube Company has announced a decline in price, returning to the basis of January 1, meeting the concessions that have been made for some time by various independent mills. This has failed to bring any appreciable response from the trade, who are waiting to see whether other manufacturers will cut below the new level. While merchants are barely maintaining their assortments, no general buying movement is expected until after the turn of the year. Local jobbing business is dull, though a fair demand is reported at some outside points.

Cast-Iron Pipe—No new municipal business has been closed, though a fair tonnage has been taken on small orders, and the outlook is improving. The city of Riverside will take bids November 20 for 60 miles of pipe, both cast iron and riveted steel being used. Several bond issues have been voted for water-works improvements. It is believed that any possible opening for the importation of cast-iron pipe at this port will be removed by lower freight rates on completion of the Panama Canal.

Pig Iron—All descriptions of pig iron are extremely dull, as current requirements are light and melters pretty well supplied. Most of the foreign iron on hand is in the hands of foundries, and importers are giving out no quotations, as prices asked for their limited offerings vary considerably with conditions of sale. The present weakness of foreign markets and the expectation of lower rates on Alabama iron on completion of the Panama Canal exert a retarding influence on the market. No. 1 Southern foundry iron is nominally valued at \$22.50.

Coke—Prices continue to decline, with liberal offerings, both on hand and in transit, and only a moderate demand. German Syndicate coke is quoted at \$13 to \$14 per net ton, ex yard, and \$11 to \$11.50, per gross ton, to arrive.

Old Material—The local demand holds up well, being rather better than last month in some lines.

With no especially heavy supplies coming into the market, the usual consuming demand, which has increased somewhat in the last few years, is sufficient to prevent any heavy accumulations. While some consumers hope for lower prices on the completion of the Panama Canal, dealers do not believe it will be possible to bring scrap from outside sources to meet the prices that now prevail. Quotations are as follows: Cast-iron scrap, per net ton, \$17 to \$18; steel melting scrap, per gross ton, \$12; wrought scrap, per net ton, \$13 to \$15; rerolling rails, per net ton, \$15 to \$16.

Rolph, Mills & Co., agents for Alabama pig iron and the Ryerson lines of tools, have moved their office from the Hansford Building to room 915 Rialto Building, San Francisco.

The Pacific Hardware & Steel Company, one of the leading jobbers of the Pacific coast, is opening a branch at 1249 Utah street, Seattle, Wash., beginning with a stock of bars, sheets, plates, nails and wire. A general hardware stock will be added later. The company has also placed a stock at Bellingham, Wash.

Boston

BOSTON, MASS., November 4, 1913.

Old Material—The market continues dull, and dealers expect no improvement before the beginning of the new year. Values are as they were. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of \$2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices.

Heavy melting steel	\$8.25 to \$8.50
Low phosphorus steel	13.75 to 14.75
Old steel axles	13.75 to 14.75
Old iron axles	21.25 to 21.75
Mixed shafting	13.25 to 13.50
No. 1 wrought and soft steel	10.00 to 10.25
Skeleton (bundled)	6.50 to 7.00
Wrought-iron pipe	8.00 to 8.25
Cotton ties (bundled)	7.00 to 7.25
No. 2 light	3.75 to 4.25
Wrought turnings	4.50 to 5.00
Cast borings	5.00 to 5.25
Machinery, cast	11.25 to 11.50
Malleable	8.00 to 8.25
Stove plate	7.75 to 8.00
Grate bars	6.25 to 6.50
Cast-iron carwheels	12.00 to 12.25

Buffalo

BUFFALO, N. Y., November 4, 1913.

Pig Iron—One of the leading producers reports considerable increase in placement as compared with the previous week; but the majority of furnacemen state that new orders for the week were few in number and of small aggregate tonnage. One interest reports an almost absolute cessation in purchasing. It is evident buyers are still holding back to see if prices will not touch a lower point. Quite a proportion of the inquiry received for the week was for high silicon and high phosphorus iron. Foundry melts appear to be keeping up in fairly good volume and specification on contracts was quite heavy. Prices are a little easier, though up to the present time producers of the district have been fairly firm. It remains to be seen what the outcome of the continued quietness in the buying situation will be or what the tender of large tonnage at lower prices effect. For fourth quarter delivery f.o.b. furnace we quote as follows:

No. 1 foundry	\$14.25 to \$14.50
No. 2 X foundry	14.00 to 14.25
No. 2 plain	14.00
No. 3 foundry	13.75 to 14.00
Gray forge	13.75
Malleable	14.25 to 14.75
Basic	14.50 to 14.75
Charcoal, regular brands	15.50 to 16.50
Charcoal, special brands and analyses	17.00 to 19.50

Finished Iron and Steel—The aggregate business for the past week compared favorably with that of the preceding week. The local agency of the principal interest reports that October was nearly 50 per cent. better than September and most other agencies and mills report that October placement was fully equal to that of September. There has been considerable inquiry for prices on tin plate for the coming season, and it is understood that there will be a price adjustment to \$3.40 per base box instead of the present market of \$3.50. In structural material the minimum is 1.35c. Pitts-

burg, with quick shipments made at prices averaging 1.40c. to 1.45c. Plates are 1.35c., with 1.30c. as absolute minimum. The general market on bars still seems to be 1.40c. in this territory. Specifications against contracts for wire nails and wire products are coming in freely. Prices recently announced are holding firm; \$1.60 base on nails and \$1.40 base on wire products. A considerable tonnage of reinforcing bars is being figured on this week for the Buffalo, Rochester & Pittsburgh Terminal Warehouse at Rochester, 70 x 370 ft., 6 stories in height. Some structural steel will also be required for the building. Prices for fabricated material are varying considerably, contingent upon the desirability of the work and condition of fabricators' shops as regards the amount of work on hand. Fairly good tonnages of new work are reported as due to come out for figuring shortly. Figures are soon to be received for an addition to the Onondaga Hotel, Syracuse, requiring about 800 tons of steel. Revised bids are being taken this week for the Holyoke Hotel, Holyoke, Mass., requiring 1200 tons, both of these from plans of Architects Esenwein & Johnson, Buffalo. Bids were taken this week for the 5500 tons of steel required for the new Statler Hotel, Detroit. Bids will soon be advertised for the South Park high school, Buffalo, calling for 1400 tons. The Lackawanna Bridge Company, Buffalo, has the contract for 200 tons of steel for the new foundry for the Sowers Mfg. Company, Buffalo; also for some single bridges for the Santa Fe Railroad. The Duro lithic Company, Buffalo, is low bidder for the Agronomy Building and the Stock Judging Pavilion, Cornell University, Ithaca, taking about 300 tons.

Old Material.—The principal local consumer having stopped taking scrap material for the present, the total of local consumption has fallen off very noticeably. Dealers are accordingly obliged to ship to eastern Pennsylvania districts, which are practically the only open markets for heavy steel scrap at the present time. For the first time in some months heavy steel is going to eastern Pennsylvania points from this market. Some dealers are still shipping heavy steel scrap to the Pittsburgh district on orders taken about a month ago at better prices than are now prevailing. The Pittsburgh market for this class of scrap is off to-day about 50c. to 75c. per ton from last week's quotations. Prices have also sagged on a number of other commodities on the list, attributable to embargoes placed upon them in several important consuming points in the Pittsburgh and Valley districts. Busheling scrap and machine shop turnings particularly are affected by this condition. Offerings from scrap producers are being made to dealers at low figures, which, however, the dealers are not inclined to take advantage of except for small tonnages. We quote as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	\$9.75 to \$10.50
Boiler plate sheared	12.00 to 12.50
Bundled sheet scrap	7.00 to 7.50
No. 1 busheling scrap	9.00 to 9.50
No. 2 busheling scrap	7.00 to 7.50
Low phosphorus steel scrap	16.50 to 17.00
Iron rails	15.00 to 15.50
No. 1 railroad wrought	12.50 to 13.00
No. 1 railroad and machinery cast scrap	12.00 to 12.50
Steel axles	17.00 to 17.50
Iron axles	22.50 to 23.00
Carwheels	11.75 to 12.25
Railroad, malleable	11.25 to 11.75
Locomotive grate bars	9.50 to 10.00
Stove plate (net ton)	9.75 to 10.00
Wrought pipe	8.50 to 9.00
Machine shop turnings	5.25 to 5.75
Heavy steel axle turnings	8.00 to 8.75
Clean cast borings	5.50 to 6.00
Bundled tin scrap	14.00

New York

NEW YORK, November 5, 1913.

Pig Iron.—Extreme dullness still characterizes the eastern pig iron market. Consumption by foundries has not perceptibly lessened and furnaces are quite well assured that stocks in foundry yards are relatively small. Yet there is no interest in the buying of iron for 1914 delivery. The possibility of imports is being considered and it is apparent with the decline of prices in the Cleveland district, England, that there is a nearer approach to an importing basis. From present indications, however, prices in the eastern market will not be so stiffly maintained as to furnish leeway for the entrance of foreign iron. So little iron is being bought just now that quotations are more or less nominal. It is evident that on a round transaction, \$15.75 for No. 2 X foundry at tidewater could be shaded. We quote northern iron for tidewater delivery as follows: No. 1

foundry, \$16 to \$16.25; No. 2 X, \$15.75 to \$16; No. 2 plain, \$15.50. Southern iron is quoted at \$15.75 to \$16.25 for No. 1 foundry and \$15.25 to \$15.75 for No. 2.

Finished Iron and Steel.—Prices are definitely lower without any offerings causing the changes or caused by them. Specifications continue in fair volume, remaining as evidence of the truly heavy consumption, but much new business, especially in structural material, does not appear. Mills are accordingly not running to capacity, but in a number of cases average about four working days a week. Considerable work for the New York subways will be contracted for in the remaining two months of the year, but the interest in this is of course not wide. Besides some 6500 tons on which the steel purchase has not been reported as yet by the general contractor, is about 15,000 to 18,000 tons to be subject to tenders this month and 27,000 tons for the extensions of the Fourth avenue line in Brooklyn, to come up in December. Other new structural work includes a 400-ton garage in Brooklyn for the Loose-Wiles baking institution; 600 to 800 tons for a 12-story apartment house, East Twenty-ninth street, and 400 to 500 tons for a synagogue in Newark. The awards include 2500 tons to the American Bridge Company for the Baltimore & Ohio over the Potomac River, 200 tons to Grant & Ruhling Company, for a Y. M. C. A. building, Bedford avenue, Brooklyn, and 150 tons to Snare & Triest Company for the Alsen Portland Cement Company, Alsen, N. Y. An award of 2400 tons may also be mentioned to the Kansas City Structural Company for a mining company, Juneau, Alaska. In an unusually large number of cases it would seem that live building projects suffer more or less temporary set backs owing to tenders far exceeding appropriations. In railroad cars there are further indications of early buying on a large scale, but mainly indications so far. The New York Central has asked unofficially for prices on 2000 cars, though several thousand will doubtless be bought, if any, and it is still a rumor at this writing that the Bingham & Garland will buy 350 to 700 ore cars and the Pittsburgh & Susquehanna 200 hopper cars. The Chesapeake & Ohio is offering to buy 1000 coal and 1000 box cars on a basis similar to that on which it bought cars some months ago from the Standard Steel Car Company. The Pennsylvania has placed an order for 1000 coke cars with the Cambria Steel Company. There are perhaps more signs of foreign steel makers sounding the market, but so far without business resulting. One case is noted of German steel bars offered at dock in New York at 1.25c., covering a range of sizes from, say, $\frac{1}{4}$ in. to 8 in. in diameter. We quote mill shipments of plain material and plates at 1.30c. to 1.35c. Pittsburgh, or 1.40c. to 1.51c. New York, and steel bars at 1.35c. to 1.40c., Pittsburgh, or 1.51c. to 1.56c., Pittsburgh, most makers at this writing holding bars at the higher price as a minimum. Bar iron appears to range still between 1.30c. to 1.45c., New York, and store prices are 1.95c. to 2.05c. for steel bars and 2c. to 2.10c. for iron bars and steel plates and shapes.

Cast-Iron Pipe.—Business is quiet. No important lettings in this immediate vicinity are in sight. Quotations on carload lots of 6 in. continue at \$23 to \$23.50 per net ton, tidewater, New York.

Old Material.—Another extremely dull week has passed. Consumers manifest no interest in offerings made by dealers. The slowing down of operations at steel works and rolling mills is increasing the discouragement of holders of old material. Lower prices are regarded as inevitable under these circumstances. Dealers' quotations are as follows, per gross ton, New York:

Old girder and T rails for melting	\$8.00 to \$8.50
Heavy melting steel scrap	8.00 to 8.50
Relaying rails	20.50 to 21.00
Rerolling rails	11.00 to 11.50
Iron car axles	20.50 to 21.50
Steel car axles	14.00 to 15.00
No. 1 railroad wrought	11.00 to 11.50
Wrought iron track scrap	10.00 to 10.50
No. 1 yard wrought, long	9.50 to 10.00
No. 1 yard wrought, short	8.50 to 9.00
Light iron	3.50 to 4.00
Cast borings	4.50 to 5.00
Wrought turnings	4.50 to 5.00
Wrought pipe	8.00 to 8.50
Carwheels	11.00 to 11.50
No. 1 heavy cast, broken up	11.00 to 11.50
Stove plate	8.25 to 8.75
Locomotive grate bars	7.50 to 8.00
Malleable cast	8.00 to 8.50

Ferroalloys.—One dealer reports sales of about 400 tons of 80 per cent. ferromanganese in the last week, with inquiries for about 500 tons more, but all in small lots. Both sales and inquiries are for delivery this year and the sales made were at the producers' quo-

tation of \$50, Baltimore. Business in the 50 per cent. ferrosilicon market is quiet, with quotations at \$75, Pittsburgh, for carloads; \$74 for 100 tons and \$73 for 600 tons and over.

Metal Market

NEW YORK, November 5, 1913.

The Week's Prices

Cents Per Pound for Early Delivery							
	Copper, New York.		Lead		Spelter		
	Electro-	Tin,	New	St.	New	St.	
Oct.	Lake.	Ionic.	New York.	St. Louis.	New York.	St. Louis.	
30.	16.87 1/2	16.62 1/2	39.90	4.35	4.20	5.40	5.25
31.	16.87 1/2	16.62 1/2	40.10	4.35	4.20	5.40	5.25
Nov.							
1.	16.87 1/2	16.50	40.10	4.35	4.20	5.40	5.25
3.	16.87 1/2	16.50	39.90	4.35	4.20	5.35	5.20
5.	16.87 1/2	16.50	40.25	4.35	4.20	5.35	5.20

Consumers have left copper alone and the nominal quotations for electrolytic are lower. A better tone in tin is based on expectations of activity in the near future. Lead is quiet but prices are unchanged. Spelter has eased off a few points under a lessened demand. No feature of interest have developed in antimony.

New York

Copper.—The dominant feature of the market is that consumers are leaving it severely alone and prices are nominal except for an occasional offering of resale lots, and of these there are few and they represent limited quantities. It is now over six weeks since there has been any real buying movement in copper and this is despite the fact that many consumers admit that they are not covered for December. It is felt, therefore, that there must be a resumption of buying at an early date. There is some speculation as to the proportions this expected movement will assume in view of the fact that complaints are heard that less new business is being received by manufacturers of brass and copper products and some of them are reported to have curtailed their working hours. The October statement of the Copper Producers' Association will be issued November 7 and it is awaited with especial interest, inasmuch as it may stir consumers into action. The nominal price of Lake copper to-day is 16.87 1/2c., cash, and that of electrolytic 16.50c. to 16.60c. Quotations in London to-day were £1 12s. 6d. for spot and £1 10s. for futures. Exports so far this month are 2974 tons. The exports in October were 29,007 tons.

Copper Averages.—The Waterbury average for October was 16.87 1/2c. The average New York price for Lake, based on daily quotations in *The Iron Age*, was 16.85c. and for electrolytic, 16.58c.

Pig Tin.—The expected reduction in the price of tin plates was announced on Monday, although the trade had an intimation on the previous Saturday of what was coming. The reduction, which amounts to 20c. per 100 lb. and makes the base price \$3.40 per box, Pittsburgh, is expected to have a stimulating effect on the pig tin market, inasmuch as manufacturers will now book contracts and must provide themselves with material with which to fill them. On the strength of advance information as to the reduction, there were sales of about 200 tons of early delivery tin on Saturday. The deliveries in October were 3700 tons, which occasioned surprise as some estimates were hundreds of tons under this figure. The showing is construed to mean that some dealers are carrying large stocks, in fact as heavy as any they have ever held. Stocks on hand November 1 were 2357 tons. The total visible supply October 31 was 11,857 tons, as against 10,735 tons October 31, 1912. Total deliveries in the 10 months of this year show a decrease of 3150 tons compared with the same time last year. The quotation in New York to-day is 40.25c., and those in London are £1 8s. 10s. for spot and £1 8s. 12s. 6d. for futures. Arrivals this month were 75 tons and there is afloat 2360 tons.

Lead.—Since the fair activity of early last week, the market has quieted down and to-day there is little doing, although prices are firm at 4.35c., New York, and 4.20c., St. Louis.

Spelter.—Quotations have dropped a few points and now are 5.35c. to 5.40c., New York, and 5.20c. to 5.25c., St. Louis. Consumers evidently satisfied their pressing wants in the buying movement of a week or ten days ago and for the present are showing no interest.

Antimony.—The market is unchanged at 7.25c. to 7.37 1/2c. for Hallett's, 7.62 1/2c. to 7.75c. for Cookson's and 6.50c. to 6.75c. for Chinese and Hungarian grades. The little flare-up in activity in this metal did not amount to much and dullness has settled upon the market again.

Old Metals.—The market is weak. Dealers' selling prices are nominally as follows:

	Cents per lb.
Copper, heavy and crucible	15.50 to 15.75
Copper, heavy and wire	15.00 to 15.25
Copper, light and bottoms	13.25 to 13.50
Brass, heavy	9.75 to 10.00
Brass, light	8.25 to 8.50
Heavy machine composition	13.50 to 13.75
Clean brass turnings	9.00 to 9.25
Composition turnings	11.75 to 12.25
Lead, heavy	4.25
Lead, tea	4.00
Zinc, scrap	4.37 1/2

Chicago

NOVEMBER 4.—The metal market has remained stationary throughout the past week. Sales were fairly active, particularly of copper. We quote as follows: Casting copper, 16.75c.; Lake copper, 17c. to 17.25c., for prompt shipment; small lots, 1/4c. to 1/2c. higher; pig tin, carloads, 41c.; small lots, 43c.; lead, desilverized, 4.30c. to 4.35c. and corroding, 4.55c. to 4.60c. for 50-ton lots; in carloads, 2 1/2c. per 100 lb. higher; spelter, 5.25c. to 5.30c.; Cookson's antimony, 9.50c.; other grades, 8c.; sheet zinc, \$7.50, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. sacks. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 14c.; copper bottoms, 12.50c.; copper clips, 13.25c.; red brass, 12.50c.; yellow brass, 9c.; lead pipe, 3.75c.; zinc, 3.75c.; pewter, No. 1, 26c.; tin foil, 32.50c.; block tin pipe, 33c.

St. Louis

NOVEMBER 3.—There has been some improvement and quotations are slightly higher. Lead is quoted at 4.22 1/2c. to 4.25c.; spelter, 5.30c. to 5.35c.; tin, 40.10c. to 40.55c.; Lake copper, 17.35c. to 17.60c.; electrolytic copper, 17.22 1/2c. to 17.45c.; Cookson's antimony, 7.95c. In the Joplin zinc ore market there was a gain of about \$1 per ton on the best grades, while the lower grades were about \$2 better than the week previous. The range of prices was \$40 to \$43 per ton for 60 per cent., with the top settlement for the best running to \$46. Calamine was in good demand at \$21 to \$22 for 40 per cent., with the best settlements at \$26. Lead ore was unchanged at \$52 for 80 per cent. We quote miscellaneous scrap metals as follows: Light brass, 5.50c.; heavy brass and light copper, 10c.; heavy copper and copper wire, 11.50c.; pewter, 24c.; tin foil, 28c.; tea lead, 2.75c.; zinc, 3c.; lead, 3c.

Iron and Industrial Stocks

NEW YORK, November 5, 1913.

Stock values were well maintained for a few days under generally favorable influences. Among these have been the beginning of imports of gold from Europe, an encouraging address from the chairman of the Interstate Commerce Commission construed as favorable to the freight advance by railroads, a decline in the German bank rate showing better financial conditions abroad, and indications that the pending currency legislation would be free from some of its most objectionable features. More recent developments, however, have not been quite so favorable, such as the decided tightening of money and the increasing danger of intervention in Mexico. The range of prices on active iron and industrial stocks from Wednesday of last week to Monday of this week, Tuesday being a holiday, was as follows:

Am. Can, com.....	29 1/4 - 32 1/2	Pittsburgh Steel, pref....	94
Am. Can, pref.....	90 - 92 1/2	Pressed Steel, com....	25 - 25 1/2
Am. Car & Fdy., com.....	43 1/2 - 45 1/2	Pressed Steel, pref....	55
Am. Loco., com....	29 1/2 - 31 1/2	Republic, com....	19 - 19 1/2
Am. Steel Foundries.....	26 1/2	Republic, pref....	78 1/2 - 81 1/2
Bald. Loco., com....	40 - 40 1/2	Rumely Co., pref....	47
Bald. Loco., pref....	105 1/2	U. S. Steel, com....	55 1/2 - 58 1/2
Beth. Steel, com....	30 - 31 1/2	U. S. Steel, pref....	105 1/2 - 107 1/2
Beth. Steel, pref....	71 1/2	Westinghouse Elec....	65 1/2 - 68 1/2
Case (J. I.), pref....	95 1/2	Am. Ship, com....	31
Colorado Fuel.....	27 1/2 - 29 1/2	Am. Ship, pref....	89
Deere & Co., pref....	98	Chic. Pneu. Tool....	51 1/2 - 52
General Electric.....	140 - 140 1/2	Cambria Steel.....	48 - 49
Gr. N. Ore Cert....	31 1/2 - 33	Lake Sup. Corp....	23
Int. Harv., com....	102 - 103	Pa. Steel, pref....	64
Int. Harv., Corp....	101 1/4 - 102 1/2	Warwick.....	10
Int. Pump, com.....	7	Crucible Steel, com....	15 1/2 - 16
Nat. En. & St., com....	11 - 11 1/2	Crucible Steel, pref....	89 1/4 - 91

Dividends Declared

The Pittsburgh Steel Company, regular quarterly, 1 1/4 per cent. on the preferred stock, payable December 1.

The Eastern Steel Company, regular quarterly, 1 1/4 per cent. on the first preferred stock, payable December 15.

The Inland Steel Company, regular quarterly, 1½ per cent., payable December 1.

The United States Steel Corporation, regular quarterly, 1½ per cent. on the preferred stock, payable November 29, and 1½ per cent. on the common stock, payable December 30.

The International Harvester Company, regular quarterly, 1½ per cent. on the preferred stock, payable December 1.

The American Radiator Company, regular quarterly, 1½ per cent. on the preferred stock, payable November 15, and 2 per cent. on the common stock, payable December 31.

Personal

Sir Stephen W. Furness, chairman of the South Durham Steel & Iron Company, Ltd., Stockton-on-Tees, and a director of the Cargo Fleet Iron Company, Ltd., Middlesbrough, England, and prominent in the British shipping trade, sailed from New York this week after a two weeks' stay.

On Friday evening, October 31, Joseph G. Butler, Jr., tendered a dinner to Samuel Rea, president Pennsylvania Railroad Company, at the new Hotel Ohio, Youngstown, Ohio. The guests included directors of the Pennsylvania Railroad, directors of the Pennsylvania Lines West, the inspection party of the Pennsylvania Railroad and Pennsylvania Lines West, and representatives of the industries of Youngstown.

C. T. Needham, of the iron and steel firm of John Needham & Sons, 44 Brown street, Manchester, England, arrived in New York this week. He will visit a number of points in this country, and his address will be care of H. B. Hollins & Co., 15 Wall street, New York. Mr. Needham is a member of Parliament.

Rodolfo A. Bercht, Hamburg, Germany, has resigned his position as manager of the Hamburg branch of the Fairbanks Company, New York, and has engaged in business on his own account as the direct European representative of American manufacturers. Mr. Bercht has for 12 years been connected with the Fairbanks Company, of which he spent four years at the London branch as manager of its foreign department, and eight years at the Hamburg branch, which he established. Previous to joining the Fairbanks Company he was connected with Hasenclever & Cia at Buenos Aires and Markt & Co., Ltd., at Paris. He is owner of the Russo-American Trading Company, Ltd., of Hamburg, Warsaw and Sosnowice, Russia, and principal silent partner of the firm of Gustavo Kottmann & Co., Milan, Italy.

W. J. McDowell, who for the past three years has been associated with the General Vehicle Company as electric truck salesman at Chicago, has become connected with the General Motors Truck Company in a similar capacity.

S. W. Brainard has resigned as superintendent of the plant of the Automatic Sprinkler Company, Youngstown, Ohio, to become connected with the United Engineering & Construction Company, Cleveland.

W. M. MacCleary has been appointed general sales manager of the Portsmouth Steel Company, Portsmouth, Ohio, succeeding Maynard French, resigned, effective October 27. A. F. Scherer has been appointed assistant sales manager, succeeding Mr. MacCleary.

G. F. Collister, who has been assistant to the general superintendent of the Cleveland Twist Drill Co., Cleveland, Ohio, has become manager of the tool steel sales department of the Betz-Pierce Co., Cleveland, jobber in steels.

C. E. Brodhead, Jr., has been made general manager of sales of the Scranton Bolt & Nut Company, Scranton, Pa.

C. T. Patterson, president Patterson Tool & Supply Company, New Orleans, La., spent several days in Cincinnati last week visiting the different machine tool plants in that city.

The U. S. Reduction Company, Chicago, announces that after experiments extending over several years it has succeeded in obtaining a mixture which successfully reduces, to a marked degree, the oxidation of zinc. This mixture is being placed on the market under the trade name of Nioxide.

Obituary

ADELBERT B. STETSON, for many years the moving spirit in the Bucyrus Company, South Milwaukee, died at Milwaukee, Wis., last week, aged 71 years. He retired from active participation in the business about 10 years ago. After serving throughout the civil war, Mr. Stetson studied engineering and joined the Bucyrus Company, then of Bucyrus, Ohio, of which he became vice-president and chief engineer. When the company sought a new location, he was assigned to make the selection, and he determined upon South Milwaukee, where a great plant has been developed.

BALTHASAR HOFFMANN, president B. Hoffmann Mfg. Company, Milwaukee, died suddenly November 1, aged 54 years. He was born in Milwaukee and on the completion of the high school course entered the employ of his father, then head of the Hoffmann & Billings Mfg. Company, Milwaukee. He later organized the B. Hoffmann Mfg. Company, in which his son, Balthasar, Jr., was associated with him. The company conducts a general machine shop and deals in machinists' supplies, pipe, pipe fittings and related articles.

ISAAC BROOKE, president Floyd-Wells Company, stove manufacturer, Royersford, Pa., died October 27, aged 64 years. He was one of the founders of the company in 1883, and became president of the company when it was incorporated in 1904.

HENRY PARSONS KING, president Whittier Machine Company and Boston manager of the Otis Elevator Company, died in Boston, Mass., October 30, aged 46 years. He was graduated from Harvard in 1889. He leaves a widow and a son.

ALBERT CHARLES DIPPLE, of the Fulton Foundry & Machine Company, Brooklyn, N. Y., died October 28.

The New Alabama Wire Plant.—It is stated that the plant of the American Steel & Wire Company at Fairfield, near Ensley, Ala., will be completed about January 1. Its capacity will be about 10,000 tons a month. When it is operated to full capacity 700 men will be employed.

The New York Central Railroad has recently ordered six additional powerful passenger electric locomotives from the General Electric Company for terminal service out of New York City. Early in the year 10 electric locomotives of the most powerful type ever built, weighing 100 tons each, were ordered from this company for the same service. While the new machines are of the same type and construction, they are somewhat heavier, weighing 110 tons, and, due to recent advancement in locomotive design, have materially increased capacity for continuous service. They will develop 2000 hp. continuously, or 2600 hp. for one hour.

W. H. Leland & Co., grinding machines, Worcester, Mass., announce that their business is now being conducted under the name of Leland-Gifford Company, the change having been made November 1. Members of the firm remain the same. The following direct representatives have been appointed: S. Nikoloff, Western representative, 1533 Dime Bank Building, Detroit, Mich.; Stanley B. Dowd, for Boston territory, 86 Hobart street, Brighton, Mass.; Herbert P. Sawtell, for New England territory, exclusive of Boston section, with headquarters in Worcester, Mass.

L. Vogelstein & Co., 42 Broadway, New York, furnish the following figures of German consumption of foreign copper for the months January to August, 1913: Imports, 153,354 tons; exports, 65,84 tons; consumption, 146,770 tons. This compares with consumption for the same period in 1912 of 136,411 tons. Of the above imports, 132,435 tons were from the United States.

The first installation in France in which coke-oven gas is used for town lighting is at Roche-la-Moliere. The gas is derived from a battery of 20 Coppee ovens, producing from 24,000 to 25,000 cu.m. of gas per 24 hr., the quantity suitable for illuminating purposes being about 4000 cu.m. per day.

tation of \$50, Baltimore. Business in the 50 per cent. ferrosilicon market is quiet, with quotations at \$75, Pittsburgh, for carloads; \$74 for 100 tons and \$73 for 600 tons and over.

Metal Market

NEW YORK, November 5, 1913.

The Week's Prices

Cents Per Pound for Early Delivery

Copper, New York.	Lead		Spelter	
	Electro-	Tin,	New	St.
	Lake.	New York.	St. Louis.	St. Louis.
Oct.				
30.....	16.87½	16.62½	39.90	4.35
31.....	16.87½	16.62½	40.10	4.35
Nov.				
1.....	16.87½	16.50	40.10	4.35
3.....	16.87½	16.50	39.90	4.35
5.....	16.87½	16.50	40.25	4.35
			4.20	5.40
			5.40	5.25
			5.40	5.20
			5.35	5.20
			5.35	5.20

Consumers have left copper alone and the nominal quotations for electrolytic are lower. A better tone in tin is based on expectations of activity in the near future. Lead is quiet but prices are unchanged. Spelter has eased off a few points under a lessened demand. No feature of interest have developed in antimony.

New York

Copper.—The dominant feature of the market is that consumers are leaving it severely alone and prices are nominal except for an occasional offering of resale lots, and of these there are few and they represent limited quantities. It is now over six weeks since there has been any real buying movement in copper and this is despite the fact that many consumers admit that they are not covered for December. It is felt, therefore, that there must be a resumption of buying at an early date. There is some speculation as to the proportions this expected movement will assume in view of the fact that complaints are heard that less new business is being received by manufacturers of brass and copper products and some of them are reported to have curtailed their working hours. The October statement of the Copper Producers' Association will be issued November 7 and it is awaited with especial interest, inasmuch as it may stir consumers into action. The nominal price of Lake copper to-day is 16.87½c., cash, and that of electrolytic 16.50c. to 16.60c. Quotations in London to-day were £1 12s. 6d. for spot and £1 10s. for futures. Exports so far this month are 2974 tons. The exports in October were 29,007 tons.

Copper Averages.—The Waterbury average for October was 16.87½c. The average New York price for Lake, based on daily quotations in *The Iron Age*, was 16.85c. and for electrolytic, 16.58c.

Pig Tin.—The expected reduction in the price of tin plates was announced on Monday, although the trade had an intimation on the previous Saturday of what was coming. The reduction, which amounts to 20c. per 100 lb. and makes the base price \$3.40 per box, Pittsburgh, is expected to have a stimulating effect on the pig tin market, inasmuch as manufacturers will now book contracts and must provide themselves with material with which to fill them. On the strength of advance information as to the reduction, there were sales of about 200 tons of early delivery tin on Saturday. The deliveries in October were 3700 tons, which occasioned surprise as some estimates were hundreds of tons under this figure. The showing is construed to mean that some dealers are carrying large stocks, in fact as heavy as any they have ever held. Stocks on hand November 1 were 2357 tons. The total visible supply October 31 was 11,857 tons, as against 10,735 tons October 31, 1912. Total deliveries in the 10 months of this year show a decrease of 3150 tons compared with the same time last year. The quotation in New York to-day is 40.25c., and those in London are £1 83 10s. for spot and £1 84 12s. 6d. for futures. Arrivals this month were 75 tons and there is afloat 2360 tons.

Lead.—Since the fair activity of early last week, the market has quieted down and to-day there is little doing, although prices are firm at 4.35c., New York, and 4.20c., St. Louis.

Spelter.—Quotations have dropped a few points and now are 5.35c. to 5.40c., New York, and 5.20c. to 5.25c., St. Louis. Consumers evidently satisfied their pressing wants in the buying movement of a week or ten days ago and for the present are showing no interest.

Antimony.—The market is unchanged at 7.25c. to 7.37½c. for Hallett's, 7.62½c. to 7.75c. for Cookson's and 6.50c. to 6.75c. for Chinese and Hungarian grades. The little flare-up in activity in this metal did not amount to much and dullness has settled upon the market again.

Old Metals.—The market is weak. Dealers' selling prices are nominally as follows:

	Cents per lb.
Copper, heavy and crucible	15.50 to 15.75
Copper, heavy and wire	15.00 to 15.25
Copper, light and bottoms	13.25 to 13.50
Brass, heavy	9.75 to 10.00
Brass, light	8.25 to 8.50
Heavy machine composition	13.50 to 13.75
Clean brass turnings	9.00 to 9.25
Composition turnings	11.75 to 12.25
Lead, heavy	4.25
Lead, tea	4.00
Zinc, scrap	4.37½

Chicago

NOVEMBER 4.—The metal market has remained stationary throughout the past week. Sales were fairly active, particularly of copper. We quote as follows: Casting copper, 16.75c.; Lake copper, 17c. to 17.25c., for prompt shipment; small lots, 1/4c. to 1/2c. higher; pig tin, carloads, 41c.; small lots, 43c.; lead, desilvered, 4.30c. to 4.35c. and corroding, 4.55c. to 4.60c. for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5.25c. to 5.30c.; Cookson's antimony, 9.50c.; other grades, 8c.; sheet zinc, \$7.50, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. sacks. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 14c.; copper bottoms, 12.50c.; copper clips, 13.25c.; red brass, 12.50c.; yellow brass, 9c.; lead pipe, 3.75c.; zinc, 3.75c.; pewter, No. 1, 26c.; tin foil, 32.50c.; block tin pipe, 33c.

St. Louis

NOVEMBER 3.—There has been some improvement and quotations are slightly higher. Lead is quoted at 4.22½c. to 4.25c.; spelter, 5.30c. to 5.35c.; tin, 40.10c. to 40.55c.; Lake copper, 17.35c. to 17.60c.; electrolytic copper, 17.22½c. to 17.45c.; Cookson's antimony, 7.95c. In the Joplin zinc ore market there was a gain of about \$1 per ton on the best grades, while the lower grades were about \$2 better than the week previous. The range of prices was \$40 to \$43 per ton for 60 per cent., with the top settlement for the best running to \$46. Calamine was in good demand at \$21 to \$22 for 40 per cent., with the best settlements at \$26. Lead ore was unchanged at \$52 for 80 per cent. We quote miscellaneous scrap metals as follows: Light brass, 5.50c.; heavy brass and light copper, 10c.; heavy copper and copper wire, 11.50c.; pewter, 24c.; tin foil, 28c.; tea lead, 2.75c.; zinc, 3c.; lead, 3c.

Iron and Industrial Stocks

NEW YORK, November 5, 1913.

Stock values were well maintained for a few days under generally favorable influences. Among these have been the beginning of imports of gold from Europe, an encouraging address from the chairman of the Interstate Commerce Commission construed as favorable to the freight advance by railroads, a decline in the German bank rate showing better financial conditions abroad, and indications that the pending currency legislation would be free from some of its most objectionable features. More recent developments, however, have not been quite so favorable, such as the decided tightening of money and the increasing danger of intervention in Mexico. The range of prices on active iron and industrial stocks from Wednesday of last week to Monday of this week, Tuesday being a holiday, was as follows:

Am. Can, com.....	29 1/4 - 32 1/2	Pittsburgh Steel, pref.....	94
Am. Can, pref.....	90 - 92 1/4	Pressed Steel, com.....	25 - 25 1/2
Am. Car & Fdy, com.	43 1/2 - 45 1/4	Pressed Steel, pref.....	95
Am. Loco, com.....	29 3/4 - 31 1/4	Republic, com.....	19 - 19 1/2
Am. Steel Foundries.....	26 1/2	Republic, pref.....	78 1/2 - 81 1/2
Bald. Loco, com.....	40 - 40 1/2	Rumely Co, pref.....	47
Bald. Loco, pref.....	105 1/2	U. S. Steel, com.....	55 1/2 - 58 1/2
Beth. Steel, com.....	30 - 31 1/2	U. S. Steel, pref.....	105 1/2 - 107 1/2
Beth. Steel, pref.....	71 1/2	Westinghouse Elec.....	65 1/2 - 68 1/2
Case (J. L.), pref.....	95 1/2	Am. Ship, com.....	31
Colorado Fuel.....	27 3/4 - 29 1/2	Am. Ship, pref.....	89
Deere & Co, pref.....	98	Chic. Pneu. Tool.....	51 1/2 - 52
General Electric.....	140 - 140 1/2	Cambria Steel.....	48 - 49
Gr. N. Ore Cert.....	31 1/2 - 33	Lake Sup. Corp.....	23
Int. Harv., com.....	102 - 103	Pa. Steel, pref.....	64
Int. Harv., Corp.....	101 1/4 - 102 1/2	Warwick.....	10
Int. Pump, com.....	7	Crucible Steel, com.....	15 1/2 - 16
Nat. En. & St, com.	11 - 11 1/2	Crucible Steel, pref.....	89 1/2 - 91

Dividends Declared

The Pittsburgh Steel Company, regular quarterly, 1 3/4 per cent. on the preferred stock, payable December 1.

The Eastern Steel Company, regular quarterly, 1 1/4 per cent. on the first preferred stock, payable December 15.

The Inland Steel Company, regular quarterly, 134 per cent., payable December 1.

The United States Steel Corporation, regular quarterly, 134 per cent. on the preferred stock, payable November 29, and 134 per cent. on the common stock, payable December 30.

The International Harvester Company, regular quarterly, 134 per cent. on the preferred stock, payable December 1.

The American Radiator Company, regular quarterly, 134 per cent. on the preferred stock, payable November 15, and 2 per cent. on the common stock, payable December 31.

Personal

Sir Stephen W. Furness, chairman of the South Durham Steel & Iron Company, Ltd., Stockton-on-Tees, and a director of the Cargo Fleet Iron Company, Ltd., Middlesbrough, England, and prominent in the British shipping trade, sailed from New York this week after a two weeks' stay.

On Friday evening, October 31, Joseph G. Butler, Jr., tendered a dinner to Samuel Rea, president Pennsylvania Railroad Company, at the new Hotel Ohio, Youngstown, Ohio. The guests included directors of the Pennsylvania Railroad, directors of the Pennsylvania Lines West, the inspection party of the Pennsylvania Railroad and Pennsylvania Lines West, and representatives of the industries of Youngstown.

C. T. Needham, of the iron and steel firm of John Needham & Sons, 44 Brown street, Manchester, England, arrived in New York this week. He will visit a number of points in this country, and his address will be care of H. B. Hollins & Co., 15 Wall street, New York. Mr. Needham is a member of Parliament.

Rodolfo A. Bercht, Hamburg, Germany, has resigned his position as manager of the Hamburg branch of the Fairbanks Company, New York, and has engaged in business on his own account as the direct European representative of American manufacturers. Mr. Bercht has for 12 years been connected with the Fairbanks Company, of which he spent four years at the London branch as manager of its foreign department, and eight years at the Hamburg branch, which he established. Previous to joining the Fairbanks Company he was connected with Hasencler & Cia at Buenos Aires and Markt & Co., Ltd., at Paris. He is owner of the Russo-American Trading Company, Ltd., of Hamburg, Warsaw and Sosnowice, Russia, and principal silent partner of the firm of Gustavo Kottmann & Co., Milan, Italy.

W. J. McDowell, who for the past three years has been associated with the General Vehicle Company as electric truck salesman at Chicago, has become connected with the General Motors Truck Company in a similar capacity.

S. W. Brainard has resigned as superintendent of the plant of the Automatic Sprinkler Company, Youngstown, Ohio, to become connected with the United Engineering & Construction Company, Cleveland.

W. M. MacCleary has been appointed general sales manager of the Portsmouth Steel Company, Portsmouth, Ohio, succeeding Maynard French, resigned, effective October 27. A. F. Scherer has been appointed assistant sales manager, succeeding Mr. MacCleary.

G. F. Collister, who has been assistant to the general superintendent of the Cleveland Twist Drill Co., Cleveland, Ohio, has become manager of the tool steel sales department of the Betz-Pierce Co., Cleveland, jobber in steels.

C. E. Brodhead, Jr., has been made general manager of sales of the Scranton Bolt & Nut Company, Scranton, Pa.

C. T. Patterson, president Patterson Tool & Supply Company, New Orleans, La., spent several days in Cincinnati last week visiting the different machine tool plants in that city.

The U. S. Reduction Company, Chicago, announces that after experiments extending over several years it has succeeded in obtaining a mixture which successfully reduces, to a marked degree, the oxidation of zinc. This mixture is being placed on the market under the trade name of Noxide.

Obituary

ADELBERT B. STETSON, for many years the moving spirit in the Bucyrus Company, South Milwaukee, died at Milwaukee, Wis., last week, aged 71 years. He retired from active participation in the business about 10 years ago. After serving throughout the civil war, Mr. Stetson studied engineering and joined the Bucyrus Company, then of Bucyrus, Ohio, of which he became vice-president and chief engineer. When the company sought a new location, he was assigned to make the selection, and he determined upon South Milwaukee, where a great plant has been developed.

BALTHASAR HOFFMANN, president B. Hoffmann Mfg. Company, Milwaukee, died suddenly November 1, aged 54 years. He was born in Milwaukee and on the completion of the high school course entered the employ of his father, then head of the Hoffmann & Billings Mfg. Company, Milwaukee. He later organized the B. Hoffmann Mfg. Company, in which his son, Balthasar, Jr., was associated with him. The company conducts a general machine shop and deals in machinists' supplies, pipe, pipe fittings and related articles.

ISAAC BROOKE, president Floyd-Wells Company, stove manufacturer, Royersford, Pa., died October 27, aged 64 years. He was one of the founders of the company in 1883, and became president of the company when it was incorporated in 1904.

HENRY PARSONS KING, president Whittier Machine Company and Boston manager of the Otis Elevator Company, died in Boston, Mass., October 30, aged 46 years. He was graduated from Harvard in 1889. He leaves a widow and a son.

ALBERT CHARLES DIPPLE, of the Fulton Foundry & Machine Company, Brooklyn, N. Y., died October 28.

The New Alabama Wire Plant.—It is stated that the plant of the American Steel & Wire Company at Fairfield, near Ensley, Ala., will be completed about January 1. Its capacity will be about 10,000 tons a month. When it is operated to full capacity 700 men will be employed.

The New York Central Railroad has recently ordered six additional powerful passenger electric locomotives from the General Electric Company for terminal service out of New York City. Early in the year 10 electric locomotives of the most powerful type ever built, weighing 100 tons each, were ordered from this company for the same service. While the new machines are of the same type and construction, they are somewhat heavier, weighing 110 tons, and, due to recent advancement in locomotive design, have materially increased capacity for continuous service. They will develop 2000 hp. continuously, or 2600 hp. for one hour.

W. H. Leland & Co., grinding machines, Worcester, Mass., announce that their business is now being conducted under the name of Leland-Gifford Company, the change having been made November 1. Members of the firm remain the same. The following direct representatives have been appointed: S. Nikoloff, Western representative, 1533 Dime Bank Building, Detroit, Mich.; Stanley B. Dowd, for Boston territory, 86 Hobart street, Brighton, Mass.; Herbert P. Sawtell, for New England territory, exclusive of Boston section, with headquarters in Worcester, Mass.

L. Vogelstein & Co., 42 Broadway, New York, furnish the following figures of German consumption of foreign copper for the months January to August, 1913: Imports, 153,354 tons; exports, 6584 tons; consumption, 146,770 tons. This compares with consumption for the same period in 1912 of 136,411 tons. Of the above imports, 132,435 tons were from the United States.

The first installation in France in which coke-oven gas is used for town lighting is at Roche-la-Moliere. The gas is derived from a battery of 20 Coppee ovens, producing from 24,000 to 25,000 cu.m. of gas per 24 hr., the quantity suitable for illuminating purposes being about 4000 cu.m. per day.

Practical Uses of Coke-Oven Gas

Application to Town Lighting— Effect on Cost of Coke—Production of Tar, Ammonia and Benzol

Some of the practical uses to which coke-oven gases are being put in Europe are discussed in a paper entitled "The Manufacture of Coke in Belgium," presented at the Brussels meeting of the Iron and Steel Institute by Evence Coppée of Brussels. A large part of it is a history of the development of the retort ovens, after which the author gives a description of both the Coppée and Semet-Solvay systems, inasmuch as 85 per cent. of the recovery ovens in Belgium are of these two types. It is stated that quite recently an improvement has been made in the utilization of gas in gas engines by extracting the waste heat from the burnt gases. These gases leave the engine at a temperature in the neighborhood of 500 deg. C., and they are made to pass through steam boilers of appropriate design. In this way it has been found possible to raise about 2 lb. of steam per horse-power-hour developed by the gas engine, equivalent to an increase of about 13 per cent. on the power developed.

In the application of coke-oven gas for heating metallurgical or open-hearth furnaces the author states that the surplus gas from a battery of regenerative ovens coking 100,000 tons of coal per year is sufficient to heat a Siemens furnace producing 100 tons of steel per day. The portions of the paper referring to the recovery of by-products and to the use of coke-oven gas for town lighting are substantially as follows:

Coke-Oven Gas for Town Lighting

One of the latest and probably the most profitable development in the use of surplus coke-oven gas is its application to town lighting. The transport of gas under pressure has been so perfected that it now presents scarcely greater difficulties than the transport of water. Moreover, since the old type of bat's-wing burner has now been almost entirely superseded by incandescent burners, the candle-power of the gas supply is of little importance, and the calorific power is the only point that need be taken into consideration. The ordinary surplus gas obtained from coke ovens scarcely reaches a high enough standard, however, in this respect.

Practically speaking, we may say that for town-lighting purposes a gas should have a calorific power of at least 560 B.t.u. per cu. ft. Coke-oven gas is very seldom as rich as this, and would require to be carburetted by means of benzol or mineral oil in order to bring it up to the required calorific power. In order to avoid the expense of carburetted, the more usual process is to fractionate the gas evolved from the ovens.

It has been found that the composition of the gas given off from coal during the process of distillation in a coke oven is by no means uniform. The calorific power gradually increases from the commencement of the distillation until a maximum is reached, after which the gas becomes poorer, and the results of a large number of experiments show that the average calorific power of the gas evolved between, say, the third and eighteenth hours of the carbonizing period will be in excess of 560 B.t.u. per cu. ft. By thus dividing the gas evolved from the ovens into these two parts, it is possible to use the rich portion for town lighting, while the other portion is used for heating the ovens, and any surplus can be used for power production in gas engines or other suitable purpose.

The proportion of the lighting gas to the whole will depend entirely upon the quality of the coal. At our ovens at Ressaix, for instance, we are coking what would be called a poor coal as judged by English standards, containing as it does only 18 per cent. to 19 per cent. of volatile matter, and under 9400 cu. ft. of gas per ton. The amount of rich gas of 560 B.t.u. and upwards, suitable for town lighting, is rather more than 4050 cu. ft. per ton, or about 43 per cent. of the whole. The re-

sults obtained in this field show conclusively that the production of lighting gas can be carried on simultaneously with the production of metallurgical coke, and we may expect to see very large developments on these lines in the near future.

America and Germany were the first countries to take up this question to any large extent, and at the present day Germany has no less than forty-five towns or communes which are wholly or partly supplied with lighting gas derived from coke-ovens. We are also taking up the question in Belgium, and arrangements have already been made for lighting Liège, Ghent, Mons, Ostend, one of the suburbs of Brussels, and other places with coke-oven gas. Surplus gas may, therefore, be looked upon as an important and valuable by-product, and its utilization on the above lines will further contribute to the profits already obtained, thus tending to reduce the cost of the manufacture of coke.

Economics from By-Products

The following table has been drawn up with the view of showing the cost of a ton of coke at various stages in the development of coke ovens. I have in each case assumed that the plant is working in Belgium and producing about 1500 tons of coke per week from coal of about 20 per cent. volatile matter calculated as being worth 9s. 6d. per ton delivered at the ovens, wages and other expenses being taken as equal in each case:

Per ton of coke.	Beehive oven.		Non-by-product retort oven	Waste heat by-product oven	Regenerative by-product oven
Yield of coke	68 per cent.		77 per cent.	80 per cent.	80 per cent.
Cost of coal	s. d.	s. d.	s. d.	s. d.	s. d.
Wages, upkeep, sinking fund, and general expenses	14 1	12 6	12 0	12 0	12 0
	1 11	1 6	1 8½	1 9	
	16 0	14 0	13 8½	13 9	
Total	Hot gases not used for steam raising.	Using hot gases for steam raising.			
Less—Value of by-products.					
Value of steam	1 7	1 7	1 2½		
Value of surplus gas— (a) for lighting . . . . .	...	...	...	...	5 2½
(b) for power . . . . .	...	...	...	...	2 5
Profit on by-products . . . . .	...	...	2 5	2 5	2 5
Cost price of 1 ton of coke	16 0	14 5	12 5	10 1	7 8½
					8 11

In calculating the above figures it has been assumed that the surplus could be sold for town lighting at a price equivalent to 8d. per 1000 cu. ft. after deducting the cost of purifying. I do not propose to enter into a detailed examination of the figures, but the decrease in the cost of producing 1 ton of coke, consequent upon the successive improvements, is clearly shown.

The carbonization of coal, which was at one time carried out with the sole object of producing coke and perhaps, incidentally, steam, is now accompanied by the production of other products of great value, and one might really say that in a modern coking plant where the surplus gas is sold for town lighting or used for power production, the coke is no longer, properly speaking, the principal product manufactured.

Tar, Ammonia and Benzol

It is impossible to speak of coke ovens without referring to the question of recovering by-products, which usually are tar, ammonia, and benzol.

The earliest process of ammonia recovery and the one which is still in greatest use is the well-known "wet" process. The gases evolved from the ovens are cooled

down to approximately atmospheric temperature in such a way that they deposit all condensable constituents—tar, water, and fixed ammonia. The remainder of the ammonia, being the free or uncombined part, is extracted from the gas by washing with water in appropriate scrubbing apparatus.

The ammoniacal liquors produced by condensation and by scrubbing are mixed together and distilled with steam and milk of lime, which results in the liberation of the whole of the ammonia. The ammonia vapors may then be either condensed to form concentrated ammonia liquor or more usually they are passed into a saturator containing sulphuric acid for the formation of sulphate of ammonia.

The disadvantages which have been urged against this process are the large amount of steam necessary for distillation and the fact that the waste liquor produced is sometimes troublesome to get rid of, and other processes have been devised in which scrubbing the gas with water has been dispensed with, thus reducing the consumption of steam and the production of waste liquor.

There are several processes of this kind in use. The gases are condensed to atmospheric temperature as in the wet process, resulting in the precipitation of the tar and the fixed ammonia. At this stage the gases are passed directly into the acid bath. The condensed ammoniacal liquor containing the fixed ammonia is distilled with steam and lime as before, and the resulting free ammonia is passed with the rest of the gas into the saturator.

Much has been said and written as to the relative merits of the wet and direct processes, but in my opinion neither possesses any advantage of real importance over the other, and the position may be most fairly summarized by saying that each process has certain advantages not possessed by the other, and that the choice of one rather than the other is a matter of the local conditions under which the plant has to work.

There are other processes which have been proposed for the recovery of ammonia, quite distinct in their character from any of the processes previously referred to. These have not yet attained a practical stage, but they are interesting to note, since they show promise of effecting considerable economy in the cost of manufacture of sulphate of ammonia, if and when the difficulties which have so far prevented them from passing out of the experimental stage have been successfully overcome. The Feld and Burkheimer processes, for example, have been designed to do away with the necessity for using sulphuric acid. In these processes the ammonia is made to combine with the sulphur contained in the gas in successive stages, resulting in the end in the formation of sulphate of ammonia. There are grounds for hoping that the difficulties will ultimately be overcome and the processes brought to successful application.

Passing now to the recovery of benzol, we find that it has made great strides in the last few years, which fact has been very largely due to the increase in the use of benzol in automobiles. Benzol is recovered from the gases by scrubbing with heavy oil produced in the distillation of tar. The benzolized oil is then subjected to distillation by steam with the formation of a somewhat impure crude benzol which is afterwards suitably purified by washing with sulphuric acid and soda and redistilled for the production of rectified products.

Nitrates from Coke-Oven Gas

Before finally leaving the subject of by-product recovery I must just say a few words about another process proposed by Dr. Häusser for the production of nitric acid and artificial nitrates from coke-oven gas. The details of the process are at present being worked out, the main idea being to oxidize nitrogen in an excess of oxygen under pressure produced by the explosion of a gaseous mixture of which coke-oven gas is one of the constituents. I mention this process with a view of showing the possibilities of constant development in the future, and when we review the great strides that have been made in chemical science in the last few decades, it is impossible to predict any limit to future progress.

The question has often been raised as to whether the extension of by-product recovery may not ultimately defeat its own ends by putting on the market such increasing quantities of by-products that the supply may ultimately

reach or possibly overtake the demand, and thus force down the prices of these by-products.

Sulphate of Ammonia

A careful study of what has happened in this respect in the past, however, shows that there is very little danger of this being the case. Taking sulphate of ammonia as being the principal by-product, we find that the total world production of sulphate in 1900 was about 450,000 tons, by 1908 this had increased to 880,000 tons, while in 1912 the total production was 14,300,000 tons, the increase for the last four years being 10, 13, 7, and 10.6 per cent. on the preceding year.

The average of the prices of sulphate f.o.b. London, Liverpool, and Hull during these years was as follows:

1908	£11 13 7
1909	11 4 10
1910	12 1 6
1911	13 12 3
1912	14 4 0
1913 (four months only)	13 17 7

With the exception of 1913, which has not yet recovered from the abnormal rises of 1911 and 1912, we observe a steady rise in the price, notwithstanding the considerable increase in production. The following table shows the total production of sulphate in the years 1908 and 1912 of the five principal sulphate-producing countries, and also the amounts of sulphate used in those countries in the same years:

	Production,		Consumption,	
	1908, tons	1912, tons	1908, tons	1912, tons
Germany	313,000	492,000	291,000	425,000
England	321,000	379,000	83,000	88,000
United States	80,000	160,000	199,000	218,000
France	49,000	69,000	80,000	90,000
Belgium	29,000	44,000	40,000	46,000

It will be seen that the United States, France, and Belgium consume more sulphate than they produce; Germany consumes 84 per cent. of her very large production, while in England the consumption is only 24 per cent. of the production.

The following table shows the direct connection between the amounts of sulphate used in these countries (except the United States, for which we have no records) and the amounts of the principal food crops raised:

Total Crops Raised per Acre	Sulphate used per acre of cultivated land,				
	land,	Wheat,	Barley,	Oats,	Potatoes,
					tons
Belgium	17.83	2228	1908	2572	6.58
Germany	9.98	2012	1400	1586	5.25
England	5.35	1756		1591	5.05
France	2.23	1238	980	1154	3.18
United States	1.34	...	...	...	...

It will be seen from this table that there is plenty of room in some of the above countries, especially in England and France, for extension of the use of sulphate of ammonia. What has been attained in Belgium will no doubt be realized in the other countries, and moreover the use of sulphate is constantly extending into new areas.

Uses of the Tar

The position is much the same with reference to tar, for which new uses continue to be found. Apart from the fact that it is the starting-point of the great aniline color industry, it is an excellent liquid fuel, although hitherto it has not been largely employed in this respect. Furthermore, recent trials have proved its extreme suitability for use in Diesel engines. It is also increasingly used for tarring roads.

By the distillation of tar we produce pitch and the various middle and light oils. The consumption of pitch for briquette making increases considerably from year to year, while apart from their use for creosoting and preserving timber, the increased use of internal combustion engines will result in an increased demand for these oils as fuel, especially for marine work on account of the great advantages of liquid fuel in respect to stowage and handling and higher thermal efficiency.

Seeing that the price of coal, with which tar oils for power purposes will chiefly be in competition, can only tend to increase in the future, it is only reasonable to suppose that the price of tar oils will rise in proportion. The value of pitch, also, will necessarily follow the price of coal.

As for benzol, we are at this moment beginning to

see it being very largely used for motor traction, and there is undoubtedly a great future before it in this respect. It can also be employed for driving locomotives. There are already a good many benzol locomotives working in mines.

We have then, in my opinion, every encouragement to look forward to the future with nothing but confidence as far as by-products are concerned.

Pittsburgh and Valleys Business Notes

The puddlers' union, known as the United Sons of Vulcan, has declared a strike at the puddling plants of A. M. Byers & Co., Inc., at Pittsburgh and Girard, Ohio. This company announced about a week ago that it would open both plants and run them non-union. It has persistently refused to sign the union's wage scale, which calls for \$7 a ton, and both of its puddling plants have been idle since July 1.

The Jones & Laughlin Steel Company, Pittsburgh, has taken a contract for building three coal barges for W. Harry Brown for hauling coal down the Monongahela River, and has also taken a contract for furnace bindings and soaking pit material for the Broken Hill Proprietary Company, Ltd., New Castle, New South Wales.

The Bartley Automatic Nut & Bolt Company, Pittsburgh, has increased its capital stock from \$5000 to \$200,000.

The Standard Seamless Tube Company of Pittsburgh, which has started to build a new plant at Ambridge, Pa., has increased its capital stock from \$10,000 to \$1,200,000.

The Carnegie Mechanical Engineering Society, composed of 45 students at the Carnegie Institute of Technology, Pittsburgh, has been granted affiliate membership in the American Society of Mechanical Engineers.

George J. Hagan, contracting engineer, Pittsburgh, has taken a contract for installing American underfeed stokers at the furnaces of the Trumbull Steel Company, Warren, Ohio. The equipment includes six sheet and pair furnaces, six tin plate furnaces and eight double annealing furnaces. The same engineer is installing stoker equipment for the annealing department of the Allegheny Steel Company, Brackenridge, Pa., and for two smelting furnaces operated by the Permutit Company, Brooklyn, N. Y., manufacturer of water softening appliances.

W. N. Kratzer & Co., Pittsburgh, fabricators of structural steel, have many contracts under way, the most important being as follows: West Leechburg Steel Company, Leechburg, Pa., furnishing and erecting steelwork for rolling mill building and gas producer building; Standard Refractories Company, Claysburg, Pa., furnishing and erecting two steel buildings; the Kelly & Jones Company, Greensburg, Pa., furnishing and erecting addition to foundry building; Union Carbide Company, furnishing structural steel work for crushing and packing departments for its Soo plant.

The Mesta Machine Company, Pittsburgh, has received an order for a 40-in. condenser from the Northern Iron Company, Standish, N. Y., also orders from the Girard Iron Company, Girard, Ohio, and Wisconsin Steel Company, Chicago, for equipping their blowing engines with air heads containing the new Mesta (Iversen patent) plate valves. The last shipment of three 1000 b.h.p. gas engines built for the Canadian Car & Foundry Company was made the past week.

The Standard Car Company, Butler, Pa., is installing an 18 in. finishing mill and a combination 12 and 9-in. mill. Julian Kennedy, consulting engineer, Pittsburgh, made the plans for these mills, and they are being built by Mackintosh, Hemphill & Co. of that city. The latter firm is shipping to the Broken Hill Proprietary Company, New Castle, New South Wales, Australia, a 42 x 60 in. geared reversing mill engine to drive its blooming mill.

The blast furnace of the Carnegie Steel Company at Niles, Ohio, having been blown out, probably not to resume for some time, F. B. Quigley, superintendent of the furnace, has gone to the Ohio works of the company at Youngstown, as assistant to J. C. Barrett, superintendent of the Ohio furnaces.

Bondholders of the Dunbar Furnace Company, Dunbar, Pa., have asked the courts to foreclose a blanket mortgage given July 1, 1893, in their favor, to sell the property and pay their claims. Suit is set for December 11. Proceedings have been brought by the Fidelity Trust Company, Philadelphia, trustee. Outstanding bonds amount to \$398,000, with 5 per cent. interest payable semi-annually.

The report that the sheet mill of the Apollo Steel Company, Apollo, Pa., had closed down is untrue. The plant is in operation, but is not being driven to full capacity.

Expenditures aggregating \$1,500,000 will be made near Kermit, Mingo County, W. Va., by the United Fuel Gas Company. A pumping station, one of the most powerful of its kind in the world, is to be constructed, and a mammoth machine shop, to do all the company's tool repairing, pipe-cutting, etc., will be installed.

According to State Labor Commissioner I. V. Barton, of West Virginia, the steel, iron and tin plate industries of the State are curtailing their output. Large establishments are working only part time, the demand being below that of this time last year.

The Market Garage, of Parkersburg, W. Va., has been incorporated with \$25,000 capital stock by Eldoras McCoy, Norma V. McCoy, O. D. Strader and others.

The Thorny Creek Lumber Company has been incorporated with \$325,000 capital stock by D. C. Wills, S. A. McMullen, G. W. Eisenbeis, E. Bailey, Jr., and H. M. Landis, all of Pittsburgh, Pa.

McIlraith Bros. have selected a site for a box factory at Gassaway, W. Va.

Large Telescope for Canadian Government

A contract for the largest telescope in the world has been awarded by the Canadian government to the Warner & Swasey Company, Cleveland, Ohio. This company will construct the mounting and the John A. Brashear Company, Ltd., Pittsburgh, Pa., will grind and polish the glass and make the optical parts. The new instrument will be of the reflecting type and will have a speculum or reflecting mirror 72 in. in diameter. The Lick and the Yerkes telescopes designed and built by the Warner & Swasey Company, the former in 1887 and the latter in 1893, were at the time of their construction the largest telescopes in the world. The object glass of the former is 36 in. in diameter and that of the latter 40 in. Both of these are refracting instruments.

It is stated that important progress has been made in astrophysical and photographic lines by the use of reflecting telescopes, and especially by the work done with the 60-in. reflector at the Mt. Wilson solar observatory near Pasadena, Cal., and this has stimulated interest in this type. The Canadian telescope will weigh about 50 tons and will have a tube 30 ft. long and 7 ft. in diameter weighing 10 tons. The principal speculum will be 10 in. in thickness and will weigh approximately 2 tons. It will take about a year and a half to build the telescope and the contract price is approximately \$100,000. It will probably be erected in Ottawa.

Members of the Cleveland Engineering Society, Cleveland, Ohio, 131 in number, spent November 1 in the Pittsburgh district as guests of the Engineering Society of Western Pennsylvania. Visits were made to the plants of the Pressed Steel Car Company at McKees Rocks and the Universal Portland Cement Company at Universal. Luncheon was served by the latter company on the special train. In the evening the two societies joined in a dinner at the Monongahela House. After dinner speeches were made by Samuel A. Taylor, president; G. A. Neilson and Harry J. Lewis, of the entertaining society and E. P. Roberts, E. H. Whitlock and Willard Beahan of the Cleveland Society and others.

The largest tree in the United States is said to be the "Mother of the Forest," a giant redwood in the Calaveras grove in California, supposed to contain 140,619 board ft. of lumber.

Iron Mining in Ontario in 1912

The twenty-second annual report of the Bureau of Mines, Province of Ontario, Canada, Volume XXII, Part I, 1913, has just appeared and contains considerable information relative to iron mining developments in 1912. Iron ore was shipped from three mines last year—Moose Mountain, Bessemer and Helen—amounting to 117,357 tons, as compared with 175,631 tons in 1911. The first two mines are magnetite and the third hematite ore. The Algoma Steel Corporation was actively engaged in developing the Magpie mine and in installing a roasting plant for the treatment of the sideritic ore of which the deposit is composed. The project has not yet been successful. At the Atikokan iron mine some mining was done but no ore was shipped, the principal work during the year being the driving of four new working tunnels through the hill. Two shafts have been sunk 150 ft. deep and a third shaft is being sunk 700 ft. west of the old tunnels.

Very little mining work was done at the Moose Mountain mine until the latter part of 1912. Most of the ore is taken from No. 1 deposit by open-cut work. The production of ore from the Helen mine, operated by the Algoma Steel Corporation, was not as great in 1912 as in 1911, due mainly to the nature of the ore, a change in which necessitated a different system of mining, and to the fact that the area of marketable ore is getting smaller. The three blast furnaces of the Algoma Steel Corporation at Sault Ste. Marie, in blast during 1912, produced 800 tons of pig iron per day. The total production of ore from the Helen mine was used at the furnaces along with ore from the United States. Only development work is being carried on at the company's Bessemer mine.

The Belmont mine at Cordova mines, Ontario, is now being operated by the Buffalo Union Furnace Company and a three-compartment vertical shaft has been sunk a depth of 230 ft. A magnetic concentrator has been erected at Trenton by the Canadian Iron Mines, Ltd., for treating the ores from its Bessemer and Childs mines.

The report states that iron mining in the province is not keeping pace with the expansion of the iron industry. One reason is the ease with which Lake Superior ores can be obtained and another is the comparatively small number of mines that have been opened in Ontario.

To Protect the Small Shipper

When the Committee on Interstate and Foreign Commerce of the House of Representatives takes up for passage, at the next session of Congress, Representative Stanley's bill to regulate the ownership of common carriers engaged in interstate commerce, it will, in all probability, amend the bill so as to protect the small, independent manufacturer or producer, who is compelled to build a road of his own in order to connect with the main trunk lines which carry his goods to market. In the course of the hearing before the committee last winter it was agreed that the Interstate Commerce Commission now has power to designate which roads are and which are not common carriers. Members of the committee have privately expressed the opinion that there is much of merit in Mr. Stanley's bill.

Only Six Days a Week at Illinois Works

The Illinois Steel Company has posted notices at its works, dated November 1, to the effect that no employee is now to work more than six days a week. Wherever it is necessary, substitute crews will be put on where the regular men have heretofore been doing extra turns or overtime. One of the collateral benefits of this new plan, at a time when the work of the mills is easing up, will be to distribute the work among all of the employees, keeping employed a much larger number than would otherwise be possible.

The iron and steel industry of the Chicago district is to be discussed at a meeting in Chicago, November 19, of the Chicago section of the American Society of Mechanical Engineers. William A. Field, general superintendent of the Illinois Steel Company, South Chicago, is announced as the principal speaker. A dinner is to be a feature of the meeting. Paul P. Bird, 120 West Adams street, Chicago, is secretary of the section.

New Forging Plant at Lansing, Mich.

The Atlas Drop Forge Company, Lansing, Mich., has fully perfected its plans and let the contracts for building a new forging plant. The Wisconsin Bridge & Iron Company, Milwaukee, has been awarded the contract for the buildings, which are now in course of erection. The main buildings, which are being constructed entirely of reinforced concrete, steel and glass, comprise the office and machine shop, 66 x 203 ft.; the forge shop and power house, 120 x 450 ft., the heat treating room, pickle room and pattern room, 25 x 200 ft. The main buildings and steel yard are to be served by electric cranes, and industrial tracks will run through the entire plant. The main forge shop has a switch track running from the Lake Shore Railroad through the full length of the building. In addition to this an elevated switch is to be provided, equipped with a coal trestle for dumping coal directly into the coal storage bins. The equipment will consist of 4 hydraulic forging presses, 30 steam hammers ranging from 1000 to 10,000 lb., and 6 board hammers ranging from 500 to 1000 lb. The plant is expected to be in operation by July 1 of next year.

National Metal Trades for Worcester

The National Metal Trades Association will hold its annual convention at Worcester, Mass., in April. The decision was arrived at by the Executive Council at its recent meeting in Chicago. Worcester has a fine new hotel, the Bancroft, which is large enough to house the members and their guests and is equipped with a commodious hall for convention purposes. The exact date has not been fixed, but it will fall in the first two weeks of April, following the usual custom. This will be the first time in the history of the association that one of the smaller cities was chosen for the convention. One chief reason is that the Worcester Branch is exceedingly active, standing in numerical importance below New York, Rhode Island and Cleveland only.

The New York City dock department is actively at work preparing plans for a drydock large enough to accommodate the largest ship contemplated. It is to be on property owned by the city in South Brooklyn, acquired seven years ago. One of the economic features of the improvement makes it interesting. When this space is not used as a drydock it may be used as a berthing space for general shipping, providing a berth 1000 ft. long by 100 ft. in width. The dock is also to be made additionally serviceable because its outer slip will be wide enough to accommodate two ships of 600 ft. in length.

The American Supply and Machinery Manufacturers' Association, of which D. K. Swartwout, Ohio Blower Company, Cleveland, Ohio, is president, is conducting a campaign by means of which it hopes to increase its membership to 300 by January 1. President Swartwout has sent an appeal to each of the present members to try and secure at least one applicant for membership. F. D. Mitchell, Woolworth Building, New York, is secretary-treasurer of the association.

The Peerless Drawn Steel Company, Massillon, Ohio, recently incorporated, will engage in the manufacture of drawn steel, rerolling hot-rolled stock into rounds, squares, hexagons and flats to supply the demand of the trade. The company is remodeling the building formerly occupied by the Massillon Bridge & Construction Company, which it will occupy as a plant. It has placed orders for some new machinery equipment. E. H. Birney is the manager.

The C & C Electric & Mfg. Company, Garwood, N. J., has appointed the Robertson-Cataract Electric Company, 37 Court Building, Buffalo, N. Y., its local sales agent. F. L. Robbins, Grubb Building, Salisbury, N. C., has also been added to the company's sales staff, while its interests in Chicago and vicinity will be looked after by the Gurley Engineering Company, with offices in the Ellsworth Building.

Producer gas from low-grade fuels is to be discussed November 19 in Philadelphia by Prof. R. H. Fernald, University of Pennsylvania, before a joint meeting of the Philadelphia members of the American Society of Mechanical Engineers and the Franklin Institute.

The Steel Corporation Dissolution Suit

Additional Trade Testimony Submitted in Behalf of the Corporation—All Witnesses Set Forth Active Competitive Conditions

Competition in the Reinforcing Bar Trade

At the hearing on Tuesday, October 28, William G. Moler, Eastern sales manager for the Corrugated Bar Company, St. Louis, was the first witness called to testify in favor of the United States Steel Corporation. His company occupies a peculiar position, as it has no rolling mill but contracts with various steel companies for the manufacture of its patented forms of bars for reinforcing concrete. It is therefore in an excellent position to give evidence regarding competition in the steel trade. Mr. Moler said his company, which was practically the pioneer in its line, started operations about 12 or 15 years ago, having control of patents covering a number of different types of deformed bars. It sells mainly, however, a bar having cross ribs, which have been rolled for it by the Carnegie Steel Company, Lackawanna Steel Company and a number of other steel makers.

During the period running from 1908 to 1912, he said, competition in the sale of reinforcing bars was aggressive. Not only did the various reinforcing bar patent-holding companies compete with each other in selling to consumers, but there was also a good deal of competition between the mills rolling bars. During this period, which included all of Mr. Moler's experience in the reinforcing bar business, he said he heard of the existence of no pools whatever; if there had been any he was sure that he would have heard of them.

In cross-examination, Mr. Moler was asked about breaks in prices which occurred in the reinforcing bar market in 1909 and in 1912. He testified that there were such breaks at those times. He said that the Corrugated Bar Company, for supplying its foreign customers, secured its material through the United States Steel Products Company. The latter would quote a price which would enable his company to meet foreign competition. Sometimes this price was lower, sometimes higher, and sometimes approximately the same as that charged in the domestic market.

Youngstown Sheet & Tube Company's Strong Position

William E. Manning, general sales manager of the Youngstown Sheet & Tube Company, Youngstown, Ohio, testified that his company has always competed in all its products with the subsidiaries of the United States Steel Corporation. This competition has always been severe but fair, open and aboveboard. He said that his company started in business with a capitalization of \$600,000. This, including stocks and bonds, has now been increased to \$22,000,000. Its steel ingot capacity, he said, is from one-quarter to one-sixth of the ingot capacity of the Carnegie Steel Company and about one-fifteenth of the total ingot capacity of the Steel Corporation subsidiaries. In 1912 his company produced about 700,000 tons of ingots.

In cross-examination, Mr. Manning admitted that he attended meetings of some of the sub-committees appointed at the Gary dinners. These committee meetings, he said, were presided over by James A. Campbell, president of the Youngstown Sheet & Tube Company. Replying to a question, he said that he had heard at various times that Henry C. Frick owned stock in the Youngstown Sheet & Tube Company at some time or other. He had also heard that Mr. Frick later disposed of his holdings to certain Youngstown interests. He said, however, that his testimony in this connection was entirely of a hearsay character, having no information of his own regarding Mr. Frick's alleged holdings.

How the Pennsylvania Railroad Company Buys

On Wednesday Samuel Porcher, purchasing agent of the Pennsylvania Railroad, testified regarding the buying policy of his company. He said that the Pennsylvania Railroad, in buying, "wants the right material, at the right place, at the right time, and for the smallest amount of money possible." The rail requirements of his road, he said, are ordered from the office of the president, where such details as price and

apportionment of the orders to the various rail makers are decided on. With this exception, all orders are placed by the purchasing agent of the road. He submitted a memorandum showing approximately the amount of steel the Pennsylvania Lines east of Pittsburgh purchased during the period from 1901 to 1913. All of this, he said, was bought after competitive bids had been received from steel manufacturers, contracts being awarded at the most favorable terms obtainable.

Asked if Percival Roberts, Jr., H. C. Frick and the late Clements A. Griscom, directors both of the Steel Corporation and the Pennsylvania Railroad, had ever attempted to influence him in placing orders with the Steel Corporation subsidiaries, Mr. Porcher replied in the negative, saying that he had never been approached by them in that connection. He explained that the Steel Corporation subsidiaries had to submit bids the same as the other steel makers, and that they received contracts only when their terms were the most favorable submitted.

Two Brooklyn Buyers Find Competition

Howard Marshall of the E. W. Bliss Company, Brooklyn, N. Y., testified that his company is a buyer of plates, bars, tubes and other steel products. His company, in preparing to let a contract for its requirements, asks for bids from the various manufacturers, in order to get competitive prices, and then places the order with the company offering the most favorable terms. The bids, he said, generally vary from \$1 to \$3 a ton. On cross-examination, he said that in 1903 and 1904 there was what was known as an "agreed" price.

Otto J. Bloss of the Reliance Architectural Iron Works, Brooklyn, testified that in purchasing structural steel, bars and other steel for his company, he always does business with whichever concern will quote him the most favorable terms. He sends out inquiries for bids when his company is in need of material and he then awards the contract to the bidder offering the best price, delivery, etc. He said he had never experienced a uniformity of prices as quoted by the various bidders.

William B. Lukens Gives Interesting Testimony

William B. Lukens, secretary and treasurer of the Alan Wood Iron & Steel Company, Philadelphia, testified his company was formed as a partnership in 1857 and was not incorporated until 1886. He has been connected with the company since 1892. He said that the Alan Wood Company now has two blast furnaces and told about the various sources from which ore is obtained. He described the output of his company and told about the competitors which it has in these lines. He said competition has always been sharp and has constantly been getting more active. He further said the Alan Wood Company, in making its prices, does not follow the lead of other companies, but charges prices which it considers fair and just.

Sheet Committee Meetings After Gary Dinners

Mr. Lukens continued his testimony on Thursday. Questioned with regard to the committee meetings which followed the Gary dinners, he said he attended about six or eight of the meetings of the committee on sheets usually presided over by James A. Campbell, of the Youngstown Sheet & Tube Company, in 1908 and 1909. From 30 to 40 were present. Two representatives of the American Sheet & Tin Plate Company attended the meetings, he said, and practically all of the important sheet producers were likewise represented.

On cross-examination Mr. Lukens, gave the following summarized account of what occurred at these meetings:

There would be a discussion as to market conditions which would reflect rather accurately the extent of the operations of the mills represented. There would be a discussion as to prices, of course, with differences of opinion, and then there would be differences with regard to

the prices at which they were selling. That would be brought out. The meeting having in that way got, each man for himself, a composite photograph of the conditions of things, we would then, each for ourselves, make a statement as to what the policy of our companies would be with reference to the sale of their products. There we stopped.

Object of the Committee Meetings

He admitted that the object of the committee meetings, as he understood them, was "to try to prevent, by an appeal to the judgment and common sense of the men who were there, without placing them under any obligation whatever, a complete collapse of the steel business that threatened to follow the collapse of things in Wall street in the fall of 1907."

Mr. Lukens recalled three instances where attention was directed during the sheet committee meetings to individuals therein, who had not abided by their stated price policy, and he said when called on for explanations these members had explained that they had undergone a "change of heart," a "change of mind," or their violations were due to mistakes of salesmen. The steel market during the period of the meetings, he said, was "ragged" all the time. Judge Dickinson asked:

Q. And that would come, would it not, from unrestrained competition?

A. Well, I think we had unrestrained competition, but by appealing to the judgment and sense of those men it was to some extent prevented; not entirely.

Q. As a matter of fact, between those meetings, is it not true, that a great many of those men observed and sold at this common price that had been announced by a majority of them?

A. I do not know that they did. They said they did.

Q. I ask you if there were not occasions when attention was called in the meetings to the fact that some members of that committee had sold in the interim at prices different from what they had announced as their policy as to prices?

A. Oh, yes, that happened with unfortunate frequency.

Several Buyers Testify Regarding Competition

Col. Madison F. Cole of the R. G. Cole Mfg. Company, Newnan, Ga., manufacturer of boilers and engines, said he had heard of a pool, or "gentlemen's agreement," among manufacturers of steel between 1900 and 1904 on the price of steel plates, but he testified that he found active competition among steel makers for his business.

Victor Mauck, president John Wood Mfg. Company, Conshohocken, Pa., maker of welded steel tanks, etc., testified that his company uses approximately 8000 tons of plates and sheets a year. These are bought on contracts which are let from time to time. He testified that there is sharp competition among the steel makers and that the bids which they submit to him always vary more or less.

Paul Starrett, president George A. Fuller Construction Company, New York, testified that for 15 years prior to the organization of the United States Steel Corporation his company obtained its structural materials from the Carnegie Steel Company, with which it made yearly contracts. Since the organization of the corporation in 1901, it has purchased all of its requirements on a competitive basis, calling for bids from the structural steel manufacturers and then awarding the contract to whichever maker offered the best terms.

At the hearing on October 31 Frank H. Gordon, general sales agent of the Lukens Iron & Steel Company, Coatesville, Pa., testified that competitors of his company sold their products at varying prices and there never is any agreement between them as to the terms at which business is to be taken. He said that his company sells steel plates to a considerable extent to the Pacific coast trade and that water transportation to that market is advantageous to Eastern shippers.

J. D. Weiss of the Hyatt Roller Bearing Company, Harrison, N. J., said that his company is a large consumer of cold-rolled and other steel products, but less than one-third of what it uses is bought from the United States Steel Corporation. In making purchases, he said, the Hyatt Company finds competition active on the part of various steel makers, and their prices are never such as to indicate any kind of an agreement between them.

La Belle Iron Works Thoroughly Independent

Harry D. Westfall, vice-president and general sales manager of the La Belle Iron Works, Steubenville, O.

said his company has been independent in fixing its prices. He said: "Of course, we try to get as nearly as possible the same price our competitors get. Oftentimes we think we know what our competitors are charging, but then we may find out later that we were mistaken. The result is that we charge prices to suit ourselves."

Questioned about meetings of the plate, billet, sheet and pipe sub-committees, which were appointed at the Gary dinners, he said he attended a few such meetings. Those present talked about business conditions, about the prices at which they were taking orders, etc. Nobody ever announced a price, however, as one to be maintained by the company he represented. It was always understood that the companies represented at these meetings were not to be bound in any way as to prices.

A Southern Steel Maker Testifies

H. Sanborn Smith, vice-president and general sales agent of the Standard Steel Company, Birmingham, Ala., was questioned about conditions of competition in the steel trade which prevailed while he was general sales agent of the Lackawanna Steel Company between 1905 and 1910. He described the selling policies pursued by his company and the other companies, and he told about meetings which were attended by plate makers, rail makers, etc., at various times. At these meetings, he said, discussions as to business conditions took place. Prices, the amount of business booked, and the amount of business in sight were discussed at length. It was never understood, however, that any of the companies represented at the meetings were to be bound to maintain any certain price.

Announcement was made that the hearings will not be resumed in Pittsburgh, November 10, as was expected. Adjournment was taken until November 11, on which date the hearings will reopen in New York. The shifting of the hearings to other cities, it is now expected, will be made in the third or fourth week in November.

A National Industrial Safety Movement

The National Council for Industrial Safety has been organized at Chicago, with offices at 1130 Commercial National Bank Building. The president of this organization is Robert W. Campbell, chairman of the safety committee of the Illinois Steel Company. The secretary and treasurer is W. A. Cameron, formerly with the American Steel Foundries. Its object is to promote the conservation of human life, to establish a conveniently located headquarters for the maintenance of a clearing house of safety information, and to promote throughout the country the organization of local councils interested in safety work in affiliation with this national council. Its further object is the general promotion of safety along the lines that have been inaugurated by various corporations so that the safety movement may become a national campaign. Membership in this council is available to individuals, firms, corporations or organizations interested in the question of safety, and provision has been made for both active and associate membership. A copy of the constitution and by-laws of the council may be secured from the office in Chicago.

The Power Economy Engineering Company, 2041 East Third street, Cleveland, Ohio, which has been engaged as a selling agency for power plant appliances, has arranged to expand and will cover the full line of power plant equipment. Among other lines the company will handle the products of the Precision Instrument Company, Taylor Instrument Company, S. C. Regulator Company, Ames Iron Works, Alberger Pump & Condensing Company, Dean Brothers Steam Pump Company, the Central Foundry Company's universal pipe and the flow meters of the General Electric Company. Associated in the company are James H. Herron, metallurgical engineer, who is not taking an active part in the conduct of the business, and C. B. Ashmead and R. M. Gates.

In the large plant of the Federal Lead Company, at Alton, Ill., a bath house has been completed at a cost of about \$12,000, through which the employees must pass in entering and leaving the works and which will accommodate 350 men at one time. The company plans to make it as nearly obligatory as possible that the men shall bathe on leaving the plant and shall wear different working clothes from those in which they come from their homes.

Trade Publications

Steam Engine and Governor.—Ball Engine Company, Erie, Pa. Two bulletins. The first illustrates a high-speed center-crank steam engine, the leading feature of which is the governor treated especially in the second bulletin. This governor consists of a pivoted eccentric with a centrifugal weight connected to it so that they move in opposite directions, and a spring which carries the weight and resists its centrifugal force. This governor is designed to eliminate heavy pressure on the pivots and so lessen the wear.

Pumps.—W. & B. Douglas, Middletown, Conn. Catalogue L, bulletins Nos. 9, 11 and H-6, and a diaphragm pump bulletin. Catalogue L treats of single-acting geared working-head pumps for factory and domestic use. The hunchback type is so designed that pipes and rods can be removed from the well without moving the head. Bulletin No. 9 describes triplex power pumps; bulletin No. 11, miscellaneous pumps, including the centrifugal type, and bulletin H-6, spraying and domestic pumps, and pneumatic outfits. The diaphragm pump illustrated in the special bulletin is used extensively by contractors and public service corporations. Directions for ascertaining the diameter of cylinders, length of stroke and power required for varying needs are included.

Chucks.—Cushman Chuck Company, Hartford, Conn. Illustrated catalogue. Relates to a large line of independent and universal chucks, jaws and arbors. The independent chucks have unusually large ribs on which the jaws slide, that are said to stand the strain without breaking or undue wearing. The jaws of the universal chuck have curved teeth, designed to fit the scroll thread in any position. They are hardened before grinding. A special chuck for the back end of cutting-off machines is illustrated. Cross-sections of chucks are shown and information as to lathe outfits and directions for fitting lathe chucks are given.

Saw Fitting Equipment.—Hanchett Swage Works, Big Rapids, Mich. Illustrated catalogue. Treats of band, circular, rip and cross-cut saw and lap grinding machines and other saw equipment. Attention is called to the sliding-gear transmission on the automatic bandsaw sharpening machines, which are claimed to insure an even feed of the saw, and beveled gibs for taking up wear. A combined hand and power forge, a saw brazing table, various types of swages and swage shapers are among the special equipment illustrated.

Foundry Equipment.—J. D. Smith Foundry Supply Company, Cleveland, Ohio. Folders and bulletin. Relate to a molding machine, squeezer and core ovens. The drop pattern and stripping plate molding machine is made in two types. Class B has two sets of gears, operated by a hand lever above the floor level. The counterweighted moving parts are claimed to insure a maximum of output. The squeezer has an overhead device operated by a lever, which is claimed to have a greater squeezing power than one operated with a horizontal pull. Core ovens made by this company are of the rolling drawer type. They are under fired and fitted for coal, coke, oil or gas. The ovens require no excavation and are substantially tied together. A bulletin illustrates a battery of ovens installed in a special core making building for the Ferro Machine & Foundry Company, Cleveland, Ohio, which is said to be the largest small core making plant in the country.

Drilling and Boring Machines.—Fox Machine Company, Grand Rapids, Mich. Bulletin No. 66 and a pamphlet. In the first illustrations and descriptive matter explain the operation of a boring machine which is intended to be attached to a post or column. One of the special features of this machine is the bevel gear driving mechanism which is completely inclosed, and in the entire machine the only working part exposed is the spindle. The pamphlet deals with a line of multi-spindle drilling machines, which can be supplied with round or rectangular heads of different sizes for handling a number of small drills. The several types of machine are illustrated and briefly described, together with views of the different head arrangements which can be furnished.

Motor-Driven Pumps.—Vaile-Kimes Company, Dayton, Ohio. Collection of bulletins. Illustrate and describe a large line of motor-driven pumps for use in connection with hydro-pneumatic water supply systems, deep well pumping, factory water supply and cellar drainage. In all of the bulletins tables of sizes, capacities and dimensions, etc., are included.

Gasoline Engines and Tractors.—Waterloo Gas Engine Company, Waterloo, Iowa. Two pamphlets. Treat of a line of gas engines which are made in a number of sizes from 1½ to 12 hp. and 15 and 25 hp. traction engines. The construction is described at some length, the text being supplemented by numerous halftone engravings.

Copper Clad Steel Wire.—Duplex Metals Company, Chester, Pa. Pamphlet. Treats of a copper clad wire, which is composed of a steel core or center, to which is welded a coating of pure copper. After a short historical introduction, the process by which this wire is made is briefly described. A number of views of the plant are given, together with photomicrographs, showing cross-sections of the wire. Tables of the characteristics of the wire and useful information are included.

Concrete Machinery.—Cockburn - McIlvrid Corporation, Twelfth and Monmouth streets, Jersey City, N. J. Catalogue and

pamphlets. Relate to a line of concrete machinery which includes mixers, buckets and skips, barrows and a grout mixer and ejector. All of these are illustrated and briefly described. The mixers are made in a number of different sizes and styles and are mounted on skids, trucks or pedestals.

Air Blast Regulating Valves.—Production Engineering Company, 1716 Spring Garden street, Philadelphia, Pa. Circular. Briefly describes and illustrates an air regulating valve for the blast pipe of a cupola. With this valve the pressure can be regulated between zero and 20 oz. easily and if it is necessary to shut off the air supply to the cupolas, the valve can be opened without stopping the blower. A graduated pressure gauge is placed in a convenient position for the melter, thus enabling the pressure to be increased, diminished or entirely shut off, as may be required. These valves can be supplied for any blast pipe up to 14 in. in diameter, and can be used in either a horizontal or vertical position.

Concrete Mixers.—Chicago Concrete Machinery Company, 221 Grand avenue, Milwaukee, Wis. Brochure. Shows the various types of Chicago concrete mixers which can be furnished with steam or gasoline engine or electric motor drive, and are mounted either on skids or a truck. Line drawings and tables of the various dimensions of the mixers are included.

Valve Reseating Machine.—Leavitt Machine Company, Orange, Mass. Catalogue No. 16. Deals with the Dexter improved valve reseating machine for reseating all flat and taper seated valves, ranging from $\frac{1}{4}$ to 12 in. without disconnecting the valve from the pipe. The various forms in which these machines are built are illustrated and briefly described and a partial list of users is included.

Power Hammer.—Joseph T. Ryerson & Son, Chicago, Ill. Bulletin No. 8905. Calls attention to a power hammer which is equipped with a radially swinging arm that adapts the tool to numerous classes of work that cannot be handled on the ordinary shop hammer. In addition to using the hammer on the anvil in front of the machine, it may be swung to either side and used in connection with a rotary swage block and the bending or vise attachments, thus enabling practically the entire range of forging operations to be performed. An extended description of the hammer with line drawings showing the arrangement of the various parts is included.

Pumping Engines, Condensers and Vacuum Pumps.—Heisler Company, St. Marys, Ohio. Catalogue No. 20. Covers a line of pumping engines which are built in the high duty compensating horizontal crank and flywheel types, electrically and belt-driven power pumps, barometric and surface condensers and wet and dry vacuum pumps. All of these are illustrated and described with a number of halftone engravings, line drawings and condensed tables of specifications. Views of plants at which this apparatus is installed, including the Pennsylvania terminal at New York City, are given, together with a number of tables of useful information.

Stone Channeling Machines.—Sullivan Machinery Company, 122 South Michigan avenue, Chicago, Ill. Catalogue No. 68. Presents the advantages of the company's channeling machine for quarrying cement and stone and for cutting rock walls for canals, wheel pits, dam cut-offs and similar engineering projects. After a brief historic account of the development of these machines, a detailed description of the machine and the way in which it is used, is given, the text being supplemented by numerous halftone engravings of the machine and its details and of the work done by it.

Sluice and Gate Valves.—Coffin Valve Company, Boston, Mass. Collection of loose leaf circulars. Illustrate and describe briefly a line of sluice and gate valves that are made for various sizes and pressures. In addition to views of the valves themselves, there are line drawings, giving the dimensions of the principal parts and halftone engravings showing installations of a number of the different valves. Tables and diagrams showing the discharge through these valves are given.

Machinists' Tool Grinding Machines.—Luther Grinder Mfg. Company, Milwaukee, Wis. Catalogue No. 29. Calls attention to the Dimo-grit line of grinding machines, which is the trade name for the abrasive employed. These machines are made in a number of different types for clamping to benches, for mounting on stands and also for use in connection with flexible shafts. All of these different machines are illustrated and briefly described. Mention is made of a number of different attachments which can be supplied for use with these machines for handling a wide variety of work.

Punching and Shearing Machinery.—Henry Pels & Co., 90 West street, New York City. Catalogues Nos. 42-A and 70. The first treats of a line of hand power punching and shearing machines, which are built in a number of different styles. All of these are illustrated and briefly described, and numerous condensed specification tables are included. The second catalogue relates to power-driven punching machines; beam, plate, scrap, billet, angle and hot-bar shearing machines; bar cropping machines and coping machines. These can be supplied for a direct-belt drive or for driving from a countershaft, or from an electric motor through a belt or set of gears. Illustrations of the various machines are presented, together with brief descriptions and specification tables.

Customs Decisions

Motor Truck Frames

The Board of United States General Appraisers has overruled a protest by P. C. Kuyper & Co., relating to the classification, under the tariff act of 1909, of shaped steel imported by the Sauer Motor Company for use in building chassis frames for motor trucks. The parts were un-drilled and unriveted and of pressed steel. Duty was assessed at 19-10c. per lb. under paragraph 131, as pressed steel shapes. The claim was that the material was properly dutiable at 4-10 of 1c. per lb. under paragraph 121, as structural shapes of steel, not assembled, or manufactured, or advanced beyond hammering, rolling or casting. The proof offered was to the effect that the shapes were first rolled, then pressed, sheared off and finally hammered to straighten the steel parts. The board held that the shapes are excluded from paragraph 121, as they were not made by the processes named in that paragraph, but were made substantially by pressing and shearing.

Castings for Repair Parts

Favorable action has been taken by the board on protests by the Dunbrow & Hearne Mfg. Company and C. B. Richard & Co., affecting the classification of various cast-iron repair or replacement parts for machines. Duty was assessed at the rate of 45 per cent. ad valorem under paragraph 199, act of 1909, as manufactures of metal not specially provided for. Testimony in behalf of the importers showed that the goods were iron castings advanced in condition as defined in paragraph 147. The board accordingly admitted the importations under that paragraph at 1c. per lb.

Machine Tools

In sustaining protests by F. Philip Dorn, Cleveland, Ohio, the board held that lathes, accompanied by tools, parts and accessories, are properly dutiable, under the act of 1909, as entireties under paragraph 197, which pro-

vides for machine tools. The action of the customs authorities in assessing the lathes at 30 per cent. ad valorem, as machine tools, and the accessories at 45 per cent. under paragraph 199, as manufactures of metal not specially provided for, was reversed.

Machine Grinders

Gallagher & Ascher were upheld in a contention relating to machine grinders used in polishing knives. The collector at Chicago exacted duty at 45 per cent. under the act of 1909, as metal manufactures. The importers claimed the duty should have been 30 per cent. under paragraph 197, as machine tools. The board held that, as the appliances were admittedly power-driven machines used in mechanical work on metal, they were dutiable as claimed.

Sewing Machine Presser Feet

The board has decided that presser feet, parts of sewing machines, are excluded from the castings paragraphs of the act of 1909. The case stood in the name of C. B. Richard & Co. representing the importers. The presser feet were described on the invoices as castings of malleable iron, machined and nickel-plated. The collector at New York classified the parts under paragraph 199, and exacted duty at the rate of 45 per cent. as "manufactures of metal not specially provided for." Duty was claimed by the importers, either under paragraph 147, as castings, at 8-10 of 1c. per lb., or under paragraph 148, as castings of malleable iron not specially provided for, at 7-10 of 1c. per lb. The board decided against the claims. The decision points out that since the castings were machined, tooled or otherwise advanced in condition by processes subsequent to the casting process, they thereby lost their classification as castings and became dutiable under the provision for manufactures of metal as assessed.

The 200 tons of steel required for the Northern Pacific Terminal Company's sheds at Portland, Ore., will be furnished by Charles McGonigle, architectural engineer and contractor, Portland.

The Machinery Markets

In the past few days orders came out in slightly increased volume in several cities, but trade continues dull especially in machine tools. In the New York territory demand is quiet and the manufacture of standard metal products is proceeding more slowly, although makers of various specialties continue busy. In New England there are some promising inquiries, but the scarcity of money makes purchasing less active. October was an unsatisfactory month generally in Philadelphia although traveling cranes were in better demand and some old business was closed. Cleveland has had an increased volume of orders, but they will not go far and inquiry is lacking. The export trade improved in the past few days in Cincinnati, but domestic demand continues quiet. Dullness is still the chief feature in Chicago, though need of new equipment and a desire to buy are admitted. Milwaukee buying is for immediate needs only and consequently the situation is dull and there is likelihood of a curtailment of working hours. In St. Louis business has been made up of small orders, but their aggregate is encouraging. The machinery trade is slow in Birmingham, largely because of a falling off in demand from the lumber mills and mines. Demand for machinery and tools has been aided in Texas by the cooler weather, despite the setback which was inflicted on the cotton crop by recent frosts. Quiet prevails on the Pacific coast, but there have been occasional orders of consequence and there is promise of a good demand from the lumber mills, although this branch of industry has not been altogether satisfactory.

New York

NEW YORK, November 5, 1913.

October's total of business was disappointing with most of the machinery trade. One important house figured its business for the month as being about 40 per cent. of the normal activity for the season. Other houses say that the month's aggregate was fair and better than September. With nearly all firms activity was best in the early days of the month, tapering off toward the close. Were it not for the closing of the Western Maryland list, some salesmen would have had little to show for the month. There is now before the trade a slightly better run of inquiries from scattered sources and on these the hopes for November are principally founded. One of these is from the Treadwell Engineering Company, Easton, Pa., which is considering the purchase of a small list of machines, including a milling machine, some lathes and an air compressor. Second-hand machinery has been fairly active. The trade is at a loss to know just what may be defi-

nitedly ascribed as the cause of the quiet condition which salesmen find to be general. They were told by some that the new tariff precluded buying for the present, then that the scarcity of money was a reason for slow business, and now some of them are being informed that the end of the year is too near for action. Buying of machinery usually does subside toward the Christmas holidays, but it is pointed out that it is entirely too early for any such influence to slacken buying. Manufacturers of standard metal products are not feeling any pressure of orders at the present time and their operations have eased up. The majority of shops making specialties and products of recent design continue busy.

The Knickerbocker Ice Company, 1170 Broadway, New York City, is having plans made for a brick, steel and concrete ice house to be erected at 184th street and Laurel Hill road, to cost about \$300,000. Mortensen & Co., 114 East 28th street, New York, are the architects. Wesley M. Oler is president.

The Pressed & Welded Steel Products Company, Inc., Flushing, N. Y., has been incorporated with a

S. DIESCHER & SONS
Mechanical and Civil Engineers,
PITTSBURGH, PA.

capital stock of \$100,000 to manufacture metal forgings. J. N. Mackie, Brooklyn; F. A. McGirk, Patterson, N. J., and F. C. Schenck, East Orange, N. J., are directors. Arrangements for a manufacturing plant are under way.

The Fotoscope Corporation, Yonkers, N. Y., has been incorporated with \$50,000 capital stock to manufacture projection machines. F. W. & L. M. Preuss and K. K. Moore, New York City, are the directors.

The erection of a water plant has been decided upon for Garfield, N. J.

Bids will be received by the Council, Highland Park, N. J., until November 13 for a motor pumping engine.

Frederick Hart & Co., Poughkeepsie, N. Y., have been incorporated with a capital stock of \$100,000 by F. H. N. Hart, H. F. Hart and E. M. Hart, to manufacture machinery.

John B. Riley, superintendent of state prisons, Albany, N. Y., is receiving sealed proposals for water supply for the new power house at Sing Sing prison, Ossining, N. Y.

J. H. B. Hanify, the State Hospital Commission, Albany, N. Y., will receive bids until November 7 for additional boiler capacity and underground steam connections to the present buildings at the Gowanda State Hospital, Collins, N. Y.

The Moers Electric Light Company, Moers, N. Y., has been incorporated and will build a plant. H. W. Knapp and T. E. Fillmore are directors.

The Board of Village Trustees, Weedsport, N. Y., is receiving bids for an electric light plant, to be operated by a producer gas engine and suction gas engine. C. D. Van Alstine is clerk.

The water department, Mechanicville, N. Y., is arranging to purchase a pump of 3,000,000 gal. capacity. Oscar C. Abel is superintendent.

The Kitts Steam Specialty Company, Inc., Oswego, N. Y., has been incorporated to manufacture iron, brass and steel and will equip a plant. Willard A. Kitts and W. J. Kitts, Jr., 39 Cortland street, New York City, and Richard V. Sohle are the incorporators.

The Oneida Wood Pulley Company, Oneida, N. Y., is building a factory of concrete construction which it will soon occupy. The principal portion of equipment required has been contracted for.

The Suburban Gas Company, East Syracuse, N. Y., has completed plans for the erection of a gas plant on Manlius street. Construction to be commenced early next spring.

The Covert Motor Vehicle Company, manufacturer of automobile parts, Lockport, N. Y., is building an addition to its plant on Grand street.

The Lockport Paving Company, Lockport, N. Y., manufacturer of patented paving blocks, has a factory nearing completion at the foot of Market street, East Lockport.

The E. H. Ferree Company, manufacturer of aluminum goods, 62 Market street, Lockport, N. Y., has purchased the four-story factory formerly occupied by the Covert Motor Vehicle works and the Harrison Radiator Company, and is equipping and moving into its new quarters. Eugene H. Ferree is president.

The Roseville Silk Mill Company, Binghamton, N. Y., is planning an addition to its plant providing for 50 looms.

The Hill Piano Stores Company, Inc., Jamestown, N. Y., has been incorporated with a capital stock of \$75,000 to manufacture and deal in pianos, etc., and will establish a plant. W. W. Campbell and L. A. Clarke, Jamestown, and J. J. Lenhart, Bemus Point, N. Y., are the incorporators.

The Bennett & Lewis Textile Company, Cohoes, N. Y., manufacturer of underwear, is erecting an addition.

Seymour P. White, W. B. Hill and R. C. Palmer, Ellicott Square, Buffalo, N. Y., have incorporated the American Metal Ware Company with a capital stock of \$25,000. A manufacturing plant will not be equipped at present, as the company will have its product made under contract for the time being.

The Peerless Motor Engine Company, Buffalo, has been incorporated to manufacture marine motor engines. E. L., G. W. and M. B. Grimm are the directors.

The Autocratic Mfg. Company, Buffalo, capitalized at \$50,000, has been incorporated to manufacture motorcycles and side cars and will equip a plant. Frank Maytham, F. S. Mott and A. W. Plumley, of Buffalo, are the incorporators.

Henry G. Davis, Buffalo, has purchased the warehouse property of the Corn Products Company at Chicago and Scott streets and the Lehigh Valley and

New York Central railroads in that city and will rebuild and fit it for leasing for light manufacturing purposes at a total cost of from \$120,000 to \$130,000.

The Automatic Transportation Company, Buffalo, N. Y., is building a two-story factory, 53 x 150 ft., this being a duplicate of the building constructed three years ago.

The Loose-Wiles Biscuit Company, Boston, Mass., is building a new factory at Thompson avenue, Queens place and Orton street, Long Island City, 220 x 430 ft., ten stories. It is said to be the largest industrial building now in construction in the United States. The Turner Construction Company is the contractor.

Catalogues Wanted

Wright, Schooley & Morse, accountants, auditors and engineers, Woolworth Building, New York, wish to add to their files for reference purposes catalogues, price lists and other data covering mill equipment.

New England

BOSTON, MASS., November 4, 1913.

Business has fallen off materially. In rare cases the machinery builders are busy, but as a rule their production has been curtailed. The dealers mentioned few sales. Some promising inquiries are reported, but even in cases where machinery is badly needed owners are compelled to put off placing orders because of lack of ready funds. The banks have tightened up on loans materially. Collections are slow. Yet the condition cannot be called a depression in the generally accepted sense of the word, because it seems to lack those elements which tend toward a long continuance. Machinery is hit harder than nearly any other line of manufactured product. Most users are running normally full.

The entire equipment of the Anthony Screw Company, Worcester, Mass., was sold at auction October 29. Most of the machinery is old, and the prices paid were correspondingly low. The few machines of later model did not bring forth the spirited bidding which has prevailed at machinery auctions in recent years. Some of it was withdrawn because of the low figures named.

The business of the Pope Mfg. Company, Hartford, Conn., manufacturer of motor cars, will be continued with Col. Albert L. Pope, the corporation's president, as the receiver. Confidence exists that some satisfactory plan of reorganization will be formulated, so that the business will remain as one of the important industries of Hartford. The loss of the plants of the American Locomotive Company and the General Motors Company from New England has been felt, and Hartford has been a serious loser through the shutting down of the works of the Columbia Company.

The firm name of the W. H. Leland Company, Worcester, Mass., manufacturer of grinding and drilling machines, and finisher of crankshafts, has been changed, beginning November 1, to the Leland-Gifford Company, for the two principal partners, W. H. Leland and Albert J. Gifford. The new title carries with it no change in the personnel of the firm nor in the management. The third partner, F. Nikoloff, has been made the Western representative of the firm, with offices in the Dime Bank Building, Detroit, Mich.

The addition to the foundry of Foster, Merriam & Co., Meriden, Conn., manufacturer of cabinet hardware and brass and gray iron castings, will be 50 x 120 ft., and will be parallel with the old building and connected with it. The addition will be equipped with overhead trolley system and other apparatus for handling material economically, and will house two cupolas which will run on different grades of iron. Employment will be given to 75 molders.

James Daley, Eastport, Me., will build an addition to his machine shop to take care of increasing business.

The Beaton & Cadwell Mfg. Company, New Britain, Conn., manufacturer of metal specialties, has acquired the business of the Eagle Mfg. Company, of New Jersey, maker of air, steam and water fittings, and will locate it in New Britain in a few months. Additional space will be required for the department, and it is proposed to build an addition to the present factory early next year.

The H. Lydall & Foulds Needle Company is to move its plant from Lydallsville, Conn., to the second floor of the Carlyle Johnson Machine Company, Manchester, Conn., the purpose being to secure greater manufacturing space.

The New England Cable Company, Lowell, Mass.

has been organized to establish works for the manufacture of wires, cords and cables for electrical purposes. D. J. Macdougal is president and Samuel Dunsford treasurer and general manager. Mr. Dunsford has had a long experience in this branch of industry, formerly being the head of the Lowell Insulated Wire Company, and having been associated with other companies making these specialties. It is proposed to occupy an existing manufacturing building.

The Bristol Brass Company, Bristol, Conn., will erect an addition to its muffle building, 100 x 100 ft., of brick construction.

The published reports that the Stevens-Duryea Company, Chicopee Falls, Mass., manufacturer of motor cars, would add to its recently established works at East Springfield, Mass., are not confirmed by the management.

The business of the Palmer Iron Foundry, Palmer, Mass., has been sold by Ralph B. Francis to Walter B. Taylor and Joseph E. Slattery, two of the employees.

Additions to general manufacturing facilities of New England include the following: Lowell Bleachery, Lowell, Mass., addition; Outlet Company, Providence, R. I., seven-story reinforced concrete factory to cost \$175,000; Salts Textile Company, Bridgeport, Conn., addition to wash house to cost \$75,000; William Foulds & Co., Manchester, Conn., a new firm, paper mill at Parker Village, 85 x 120 ft., one story, with boiler house, 40 x 40 ft., engine room, 25 x 64 ft., and dry room, 28 x 68 ft.

Philadelphia

PHILADELPHIA, PA., November 3, 1913.

While the large majority of the machinery manufacturers and merchants report October as having been an unsatisfactory month, here and there reports of a fair volume of business are heard. These are largely based, however, on the closing of deals which have been under negotiation for a long time, rather than representing any improvement in the immediate demand. Business in the past week has, like its immediate predecessors, been irregular, the demand being largely along the line of single tools. A somewhat better demand for electric traveling cranes is reported, several small propositions still remaining unclosed. No improvement in the railroad demand for machine tools is apparent. The outlook for any improvement in the demand for the remainder of the year is not considered favorable. Smaller operating forces are in prospect. The local locomotive builder does not anticipate operating over 50 per cent. of capacity in the winter months. Second-hand machinery has been rather quiet, although the demand for power equipment continues fair. Steel casting plants are becoming less actively engaged, while gray-iron foundries find about an even volume of business.

The Schutte & Koerting Company, Twelfth and Thompson streets, is taking estimates for a new machine shop, 90 x 120 ft., one story, to be erected at its plant at Cornwells, Pa. The contract will be let at an early date. On completion the company will move a portion of the equipment at its local plant to the new shop and also purchase considerable additional equipment, the exact nature of which has not yet been decided upon. Business with the company continues satisfactory.

The contract for the new four-story manufacturing building for the Alloway-Martin Company, manufacturer of automobile bodies, etc., at Thirty-seventh and Filbert streets, has been awarded to F. G. Meyerlitz, Peuckert & Wunder are the engineers.

Contractors are estimating on a three-story brick addition to the factory of William T. Root, at Fairhill and Race streets. The new addition will be used for an extension to the business of manufacturing shoe lasts. No power equipment will be required.

The Bloch Go-Cart Company is completing the details relative to the acquisition of a tract of land at Egg Harbor City, N. J., on the completion of which plans, already completed, for one unit of a large manufacturing plant will be given out for estimate. Details of the proposed plant are withheld, pending completion of negotiations for the land.

Plans for a one-story brick garage and cooper shop to be erected at Oxford street and Germantown avenue for the Rieger & Gratz Brewing Company are being estimated on. Peuckert & Wunder are the engineers.

The department of supplies, room 312, City Hall, will take bids until November 10 for equipment, including a motor-driven engine lathe, for the electrical

bureau. Specifications may be obtained at the office of Herman Loeb, director.

It is stated that John T. Windrim, architect, has plans under way for a three-story brick building, 75 x 450 ft., to be erected at Twenty-sixth and Christian streets for the Philadelphia Electric Company, which is to be used as a machine shop and for general office purposes. Plans are expected to be ready for estimate in the near future.

C. Koch, barrel manufacturer, Swanson and McKean streets, contemplates the erection of a two-story addition, 100 x 150 ft.

A contract has been closed for the erection of a one-story brick garage, 66 x 80 ft., at the rear of 660-666 North Broad street, for Samuel Sternberger. Sauer & Hahn are the architects.

Chicago

CHICAGO, ILL., November 3, 1913.

Buyers of machinery are still unwilling to incur new purchase obligations and general business remains decidedly dull. What is generally true applies to the machinery trade, namely, that the lack of inquiry does not result from an absence of desire on the part of manufacturers for new equipment. Additional prospect of business is offered by the new motor car project for which a \$3,000,000 plant is proposed at Minneapolis.

The Enterprise Parlor Furniture Company, Chicago, will erect a two-story brick factory at 2319 West Huron street, at a cost of \$15,000.

The elevator of the Northwestern Brewery, Chicago, was recently damaged by fire, the loss being estimated at \$200,000.

Armour & Co., Chicago, have taken out a building permit providing for the erection of a one-story brick car shop, 58 x 289 ft., at an estimated cost of \$16,000.

P. Casey is having plans prepared for the erection of a one-story box factory, 75 x 101 ft., at 1324 West Randolph street, Chicago, to cost about \$12,000.

The Illinois Felt Company, Chicago, is building a one and two-story brick factory at 2511 Park avenue. The building will be 95 x 100 ft., and will cost \$20,000.

The Private Motor Service Company, 10 South La Salle street, Chicago, has been incorporated with a capital stock of \$10,000 by Charles S. Vougher, Walter H. Eckert and Warren B. Buckley, to manufacture and deal in automobile parts and accessories.

The new \$2,000,000 shops of the Wabash railroad have been placed in operation at Decatur, Ill. In addition to the large amount of machinery moved to the new plant from the former Springfield shops, a long list of new tools was purchased.

The Central Box Board Company, Sterling, Ill., is having plans prepared for a 150 x 150-ft. two-story fireproof warehouse, construction of which will begin at once.

The Joliet Forge Company, Joliet, Ill., has been incorporated with a capital of \$80,000 by J. J. Snarpe, H. W. Sharpe and J. A. Holmes.

The Anchor Folding Box Company, Benton, Ill., has been incorporated with a capital stock of \$50,000 by E. C. Palmer Rosa, George A. Cibulka and Orla M. Hill.

The Joliet Oil Tractor Company, Joliet, Ill., has been incorporated with a capital stock of \$10,000 by Hugh J. Mitchell, Thomas C. Jungels and George H. McCracken.

The Struthers Mfg. Company, Peoria, Ill., has been incorporated with a capital stock of \$200,000 by Reuben F. Struther, John H. Owens and Arthur M. Ottman to manufacture lightning rods, hardware specialties, light fixtures and wire fence.

The plant of the B. D. Brooks Lumber Company, owner of a planing mill at Chase street and the Belt Railroad, Indianapolis, was damaged \$10,000 by fire, the principal loss being to the machinery.

The Tell City Brewing Company, Tell City, Ind., has announced plans for the erection of an addition to its ice factory.

Bids will be received by L. S. Bowman, county auditor, Richmond, Ind., until November 8, for installing an electric light system at the county infirmary.

The Michigan Foundry & Supply Company, Detroit, has increased its capital stock from \$2000 to \$15,000.

The Benton Harbor Malleable Foundry Company, Benton Harbor, Mich., has filed amended articles of incorporation increasing its capital stock from \$80,000 to \$270,000.

Officers of the Morton Salt Company, Ludington,

Mich., are perfecting plans for contemplated additions to the Anchor salt plant in which four new boilers will be installed with an additional capacity of 2000 hp.

The International Telephone Meter Company, Webster City, Iowa, has been organized with an authorized capital of \$1,000,000 and will manufacture a telephone meter invented by E. H. Martin, president Martin Telephone Company.

A bond issue of \$12,000 for an electric light plant at McGregor, Iowa, has been voted.

The City Council of Ames, Iowa, has ordered the purchase of a turbine engine and condenser for the municipal electric lighting plant.

The Fort Dodge Culvert Company, Fort Dodge, Iowa, has been granted a building site for its new factory, which will be 50 x 150 ft., three stories, and will cost \$10,000.

Milwaukee

MILWAUKEE, Wis., November 3, 1913.

The month just closed was somewhat less satisfactory in a general way than the previous months, due to a dragging demand, slightly decreased production and a tightening of the money market with a resulting falling off in collections. Immediate prospects are none too bright. A few scattering orders are continually being booked, but the business is not of such volume as to inspire much confidence. Buying is only for immediate needs. Men have been laid off at some plants, while in others retrenchment has been accomplished by shortening the working day.

Capt. William Mitchell Lewis has organized the Lewis Motor Company, Racine, Wis., with a capital stock of \$250,000, to manufacture automobiles. Until a year ago Captain Lewis was president and general manager of the Mitchell-Lewis Motor Company. Rene W. Petard, late of Paris, who joined the Mitchell-Lewis interests two years ago as chief designer, is associated with Captain Lewis in the new corporation and has been elected secretary and treasurer. E. B. Hand is vice-president. The new company has leased considerable floor space in the main buildings of the Racine-Sattley Company, which abandoned its Racine works some time ago. Regular production was started November 3 and it is intended to make first deliveries before February 1. Immediate requirements in the way of machinery and tools are filled, but purchases are being made from time to time.

The Milwaukee Stamping Company, Milwaukee, has filed an amendment to its articles of incorporation changing the location of its headquarters from Milwaukee to West Allis. The company manufactures hardware specialties and its plant is located at Sixty-fourth and Pullen avenues, West Allis.

The W. N. Durant Company, manufacturer of Durant counting machines, Milwaukee, has purchased property on Buffum street, extending back to Lawton place, Milwaukee, Wis., and has begun the erection of a factory thereon. The building is to be of reinforced concrete construction, with fireproof windows of large area. The present contract is for the erection of a one-story building, with special provision made for additional stories and extensions to the south and west. An oil engine is being installed to supply power. Henry O. Winkler is president and treasurer and W. K. Winkler secretary.

The Western Motor Supply Company, Milwaukee, has been incorporated with \$25,000 capital by Roland F. Coerper, Manfred S. Gross and Herman H. Karrow to manufacture automobile parts and accessories.

The Chippewa Springs Corporation, a consolidation of the Chippewa Spring Company and Sandstone Springs Company, Chippewa Falls, Wis., will build a \$50,000 bottling and mineral water handling plant early next year. The substructure will be erected at once. Ice and refrigerating machinery is included in the equipment list. H. P. Watson, of Minneapolis, Minn., is president.

The Eau Claire Creamery Company, Eau Claire, Wis., has increased its capital stock from \$50,000 to \$100,000 and will double the size of its plant, which is one of the largest in northwestern Wisconsin.

The city of Manitowoc, Wis., is about to take over and operate the plant of the Manitowoc Electric Light & Power Co. The transfer awaits the appraisal of the Wisconsin Railway Commission. It is planned to make improvements of an extensive nature. Henry Stolze is mayor and L. K. Pitz is city engineer.

The Racine Foundry Company, Racine, Wis., is about ready to begin operations in its new pattern shop on Washington avenue, on which it has been working for two months or more. The new facilities will enable the

company to increase its production, the foundry plant having recently been improved.

The Menasha Printing Company, Menasha, Wis., which recently purchased the Menasha Paper Company, will build at once a printing and paper making plant costing \$250,000. J. C. Hopkins, architect, New York, has awarded the structural contract to the Appleton Construction Company, Appleton, Wis. The building will be of steel and concrete, 132 x 244 feet, two stories. It will be equipped with new presses, a complete engraving, electrotyping and stereotyping outfit, power units, etc. S. H. Clinedin is president.

The Waukesha Springs Company, Waukesha, Wis., has been organized by J. J. Staub, R. W. Crary and M. Crowley, to establish a large mineral water handling plant. The corporation has a capital stock of \$200,000.

The Pull-Easy Mfg. Company, Waukesha, incorporated with a capital stock of \$25,000, will manufacture a device for driving and extracting nails. G. A. Noetzel is president; W. P. Ferris, vice-president and treasurer; J. G. Gredler, secretary.

The Henry A. Steiner Mfg. Company, Chilton, Wis., manufacturer of gasoline engines, is being reorganized, following the sale of the interest of Henry A. Steiner to Mathew Steiner and Joseph Bell the, other principal stockholders. New capital will be provided and it is planned to enlarge the foundry and machine shops early next year.

Cleveland

CLEVELAND, OHIO, November 3, 1913.

Business in machine tool lines has somewhat improved. A better volume of orders came out during the week than for some time, but as there is not much inquiry pending the improvement may be only temporary. The Lake Shore Railroad has placed orders for a few machines that had been pending for some time and one order for ten lathes came from an Ohio automobile manufacturer. The Otis Steel Company closed for some of the equipment for its steel plant machine shop and finished buying its electrical equipment. Corrigan McKinney & Co. expect to close shortly for the complete crane equipment for their steel plant. A fair volume of inquiry for power plant equipment is in evidence but orders are slow in being placed. In electrical equipment the demand for small motors is good, but little business is coming out in large units.

The Kemco Electric Mfg. Company, Cleveland, has been incorporated with a capitalization of \$100,000 by W. I. Knight, C. G. Roads, Herbert Matthews and others to manufacture various specialties.

The Automatic Addressing Machine Company, Cleveland, has been incorporated with a capital stock of \$150,000 to manufacture addressing machines. Among the incorporators are W. K. Stanley, P. C. Steller and J. W. Curtis.

The DeForest Electric Welding Company, Cleveland, has been incorporated with a capital stock of \$5000 by R. J. Lamb, M. M. McLaughlin, C. F. Miser and others.

Considerable new machinery will be installed by the Kelley Reamer Company, Cleveland, which recently increased its capital stock.

The American Stove Company will erect two warehouse additions to its plant on Perkins avenue, Cleveland. One will be 49 x 72 ft. and the other 26 x 87 ft.

The Bowler Foundry Company, Cleveland, will enlarge its plant by an addition 56 x 107 ft.

The erection of a new plant for the manufacture of corrugated paper containers is under consideration in Vermillion, Ohio. Among those interested in the proposed company are F. H. Rose and Charles A. Moore, who are connected with the American Box Company in Cleveland. The erection of a one-story building providing 10,000 sq. ft. of floor space is planned.

The Galion Iron Works & Mfg. Company, Galion, Ohio, has been incorporated with a capital stock of \$10,000 by D. C. Boyd, W. Pelton, B. T. Moyer and others.

The Carl Electric Vehicle Company, Toledo, Ohio, has been incorporated with a capitalization of \$300,000 by L. M. Tenders and others to manufacture electric vehicles.

The No. 1 plant of the Federal Clay Products Company, Mineral City, Ohio, was destroyed by fire October 25, the loss being about \$75,000. The plant included considerable machinery. It is not known whether it will be rebuilt.

The Marion Stone Company, Marion, Ohio, will shortly place contracts for special equipment for handling stone and for two 75 hp. motors.

The Amherst Dynalite Company, Amherst, Ohio, is enlarging its plant by the erection of two buildings. Some new machinery will be installed.

Bids will be received by G. E. Whitney, Lima, Ohio, state hospital commissioner, until November 18, for a water-supply system.

Cincinnati

CINCINNATI, OHIO, November 3, 1913.

Contrary to expectations, the machine tool export business has shown some improvement in the past few days. Several firms report orders received that will enable them to continue operating at the present rate for the next 30 days. Domestic business is dull, with indications pointing to a quiet fall and winter, although it is hoped that the railroads will come into the market early in January, and this would considerably stimulate the machine tool trade. Both skilled and common labor is plentiful, and the supply is liable to be augmented from the automobile manufacturing districts where a large number of men have been laid off lately. One of the leading local foundries that has had considerable labor trouble for the past six months is now operating with a full complement of men. Second-hand electrical equipment is in good demand, and rebuilt machinery, of all kinds, is easier to move than new equipment.

John W. Neal, for a number of years general manager of the John H. McGowan Pump Company, has acquired a controlling interest in the Smith Electric Tool Company, 120 East Sixth street, Cincinnati. A reorganization of the company is now under way and incorporation papers will be taken out at an early date. No immediate additions to the present plant are contemplated.

The Fort Motor Company, Detroit, Mich., has not yet officially announced its intentions as to building a branch assembling plant in Cincinnati. However, it has lately had a representative in the city examining sites.

The Central Creosoted Shingle Company, Cincinnati, has been incorporated with \$8000 capital stock, and plans to erect a factory at an early date. The incorporators are William B. Mellish, David Burnet and C. B. Goodman.

The Cincinnati Pulley Machinery Company, Covington, Ky., expects to have its new plant completed within the next two weeks. The company's factory was destroyed by fire several months ago, since which time it has been making temporary headquarters in the Acme Garage Building. Only a small amount of new equipment is yet to be purchased.

The French Bros.-Baur Company, Cincinnati, contemplates erecting a milk station and refrigerating plant at Hamilton, Ohio. Garber & Woodward, architects, Cincinnati, are drawing up the plans for the proposed building.

The Triumph Ice Machine Company, Oakley-Cincinnati, has recently secured the contract for a large ice plant to be erected by the Troy Ice Company, Troy, Ohio.

The Donaldson Lithographing Company, Newport, Ky., has acquired a site on Twenty-first street, Covington, Ky., and will soon commence the erection of a brick and reinforced concrete plant that will be 150 x 400 ft., three stories. Considerable additional equipment will be required, in which is included a number of electric motors.

The Covington Drilling Machinery Company, Covington, Ky., expects to have its new plant at Fifth and Scott streets in operation before December 1. No new equipment is required at the present time.

The Cincinnati Precision Lathe Company is moving its plant from Mt. Washington, Ohio, to Detroit. A manufacturing building has been secured in the eastern part of the city that will be fitted up for doing general machine work, as well as to continue the manufacture of precision lathes.

The Fox Paper Company, Lockland, Ohio, has let contract for a power house addition. Practically all the necessary equipment has been provided for.

The Ohio Ballast Company, Milford, Ohio, intends fitting up a rock crushing plant on a site recently secured on Spring Grove avenue, Cincinnati.

The Xenia Shoe Mfg. Company, Xenia, Ohio, has been reorganized, and intends making some extensive additions to its manufacturing facilities.

Bids will be received by N. P. Weishart, village clerk, Frankfort, Ohio, until November 14 for water-works.

The Central South

LOUISVILLE, KY., November 3, 1913.

Machinery manufacturers and dealers believe that the final two months of the year will make a good showing. Many dealers report a large number of prospects but an unsettled feeling on the part of intending buyers that prevents considerable business being closed. The damage to the cotton crop in certain sections of the South will probably have the effect of making business irregular in some parts of the cotton belt, but the South as a whole is in good shape. Machine tools are moving well. Ice machinery is beginning to open up, and woodworking equipment is in good call.

The Mengel Box Company, Louisville, is enlarging its cigar box department. Some additional machinery is to be installed. H. P. Roberts is manager of the company.

The American Oak Leather Company, Louisville, is about ready to purchase electrical equipment for the operation of its cutting machinery. B. M. Henry is local manager.

The Henry Koehler Mfg. Company, Louisville, has moved its factory from 431 South Center street to Jones and N streets, having leased one of the buildings formerly occupied by the Louisville Bolt & Iron Works. Its machine shop has been enlarged by the installation of a Browne & Sharpe milling machine. The company makes a rotary bag printer.

The Louisville Steel & Iron Company, the successor of the Louisville Bolt & Iron Works, has taken out an Indiana charter. Its capital stock is \$400,000. George H. Holzbog, Jeffersonville, Ind., is president of the company.

The Kentucky Wagon Mfg. Company, Louisville, will manufacture parts which it formerly has purchased and has been buying equipment for stamping, bending and drop forging. Most of the equipment needed for the new line of work has been ordered. R. V. Board, formerly New England branch manager of the International Harvester Company, has been elected president of the Kentucky Wagon Mfg. Company.

The Imperial Wire & Iron Works, which has begun the erection of a new plant, advises that it has purchased a number of machine tools from the Harryman Machine Company, Louisville, and for that reason will not require much additional equipment for its new factory. It is to discontinue its woodworking department and confine its attention to wire and light iron working.

Joseph Bruns, receiver of the Ohio Falls Motor Company, New Albany, Ind., has been ordered to sell the property, consisting of buildings and equipment for automobile manufacture. A sale reported some time ago was not consummated.

The Webster Loose-Leaf Filing Company, Louisville, has added the manufacture of a paper punch to its line, and will be in the market for castings and other materials. It already has a machine shop.

M. H. Crump, road engineer of Warren County, Bowling Green, Ky., is in the market for a rock-crushing outfit with a capacity of 100 tons a day, and also for a grader, roller, drills and other road working equipment.

T. L. Carroll, LaCenter, Ky., has purchased a building which will be equipped for the manufacture of brooms.

The Cliver & Donovan Mfg. Company will establish a shirt factory at Lexington, Ky. Fifty power-driven machines will be installed. The officers of the company are Cincinnati men.

Martin & Hodgin, Winchester, Ky., have purchased a site for the erection of a building to be used as an automobile garage and repair shop. Machine tools will be needed.

The Illinois Central Railroad Company is reported to have appropriated \$70,000 for the construction of a roundhouse and machine shops at Princeton, Ky., one of its division headquarters. The general offices of the company are in Chicago.

Morehead, Ky., is considering the installation of a 50 hp. oil engine in its electric light plant, where it is now operating a steam boiler and engine. E. E. Maggard is manager of the plant.

A Made-in-Owensboro Exposition was held recently at Owensboro, Ky., a large number of manufacturers participating. The Guenther-Wright Machine Company, the Owensboro Forging Company, the Southern Foundry Company, the Owensboro Shovel Company and

the Universal Stenotype Company were among the exhibitors.

Moncrief & Lenoir, Knoxville, Tenn., plan to establish a 100 x 200 ft. two-story factory at Houston, Tenn., estimated to cost \$15,000. A. E. Barnes is the architect.

Nickey Bros. & Bass, Memphis, Tenn., will erect a veneer and hardwood lumber mill at Binghampton, a Memphis suburb, at a cost of about \$25,000. S. M. Nickey is president of the company and Walt. G. Bass, manager.

R. J. Darnell, Inc., Memphis, Tenn., will build a lumber and veneer mill at Batesville, Miss. The company's plant at Memphis was burned some time ago and is to be replaced at once.

G. M. Pylant, Elora, Tenn., is in the market for a 20 hp. skidder, a hoisting engine and other equipment for logging operations.

E. C. Atkins & Co., saw manufacturers of Indianapolis, Ind., have completed the erection of a building at Memphis, Tenn., to be used as their Southern branch. The company will carry saws, filing-room equipment, heavy machinery and transmission equipment in stock at Memphis.

The Gallatin Commercial Club, Gallatin, Tenn., reports that a company is being organized to erect a foundry and machine shop to replace the plant which was recently destroyed.

Birmingham

BIRMINGHAM, ALA., November 1, 1913.

Leading wholesale hardware dealers report good business, but those handling machinery exclusively admit that trade is not as active as it has been. A falling off in demand from the lumber mills and in the demand for pumps and engines on the part of the mines is reported. However, the volume of business in implements is satisfactory.

The National Cast Iron Pipe & Foundry Company, whose pipe works at Boyles, a suburb of Birmingham, are nearing completion, has voted an increase of stock from \$5000 to \$200,000. The plant expects to begin operations by January 1.

An involuntary petition in bankruptcy has been filed in Birmingham against the Birmingham Car & Mfg. Company, maker of car wheels and mining cars, by the F. W. Mark Construction Company and others. This company had a severe fire a year ago and rebuilt the plant.

The North Birmingham Fire Brick & Roofing Company has increased its capital stock to \$25,000 and, it is understood, will enlarge its fireproofing plant.

The McDonough Ore & Mining Company, Birmingham, has increased its capital stock to \$70,000 and will extend operations.

The Dauphin Island Land Company and the Dauphin Island Railway Company, Mobile, Ala., have executed a mortgage for \$220,000 and plan to establish coaling stations and terminals on Dauphin Island, on Mobile Bay. J. M. Dewberry and R. D. Johnston, Jr., Birmingham, are interested.

G. H. Kean is considering the establishment of a brick plant at Gordo, Ala.

A sawmill and planing-mill will be built by the Aliceville Lumber Company, Aliceville, Ala., at a cost of about \$30,000.

The Little River Mining Company, Gadsden, Ala., has been incorporated with an initial capital stock of \$5000 and will open coal mines.

It is reported that the Raccoon Mining Company, Altoona, Ala., will establish a power plant to furnish electricity for mining operations.

C. E. Murray, Decherd, Tenn., has leased a tract of land at Cullman, Ala., on which he will establish a sawing mill.

The city of Waycross, Ga., has granted a franchise to the Scott Investment company and W. H. Harrison, Jr., of Birmingham, Ala., for the establishment of a gas plant at a cost of \$125,000.

John L. King, Corona, Ala., plans to establish an ice factory.

Columbus, Ga., has voted a \$450,000 issue of bonds for the construction of a waterwork system.

The Davidson Sulphur & Phosphate Company, Bartow, Fla., has been incorporated with a capital stock of \$1,000,000. It will establish a phosphate plant.

The Robinson Metal Company, Tampa, Fla., has been incorporated with a capital stock of \$10,000. W. J. Robinson is president.

J. W. Nelson, Gainesville, Fla., is to install equipment for the manufacture of ice. His plant will have a capacity of about four tons a day.

St. Louis

ST. LOUIS, Mo., November 3, 1913.

Conditions in the machine tool market continue encouraging in character although the business moving is small in individual orders. A continually better feeling over the business situation is expressed and a confidence that greater activity is to be expected. Collections are reported good. Second-hand tools are in fair request.

The plant of the St. Louis Car Company, 8000 Broadway, St. Louis, was damaged by fire October 23, with a loss of \$10,000.

The Alvey Mfg. Company, St. Louis, has been incorporated, with a capital stock of \$75,000, by John A. and William E. Alvey, of St. Louis, and Ira L. Bretzfelder, of Cincinnati, to manufacture and deal in machinery.

The Bond Auto Company, St. Louis, has been incorporated with a capital stock of \$10,000 by M. W. Bond, Charles Kist and C. Bond to establish an automobile repair plant and garage.

The Forest Lumber Company, Kansas City, Mo., has increased its capital from \$1,000,000 to \$1,250,000 for the purpose of enlarging its capacity.

The Anderson Automatic Engine Works, St. Joseph, Mo., has been incorporated with a capital stock of \$50,000 by C. C. Anderson, H. S. Kratsinger and W. M. Campbell to manufacture and repair engines.

The Grand Central Motor Car Company, of St. Joseph, Mo., has been incorporated with a capital stock of \$15,000 by W. J. Hendl, H. R. Lewis and Louis Segel and will equip an automobile repair shop and garage.

A packing plant to cost, with equipment, about \$30,000, will be built by George and John Crocker at Webb City, Mo., including refrigerating plant, tanking equipment, etc.

The city of Heavener, Okla., which recently decided upon waterworks plans, is in the market for equipment. The total expenditure will be about \$30,000.

The Mid Continent Glass Sand Company, of Roff, Okla., is reported in the market for a 12-ton ice plant for installation at Roff.

Additions to the waterworks plant at Elk City, Okla., to cost about \$10,000, are planned. Address the mayor.

The Kiefer Ice & Light Company, Kiefer, Okla., has been incorporated with a capital stock of \$20,000 by Charles H. Shone and Charles F. Petty of Kiefer and D. W. Franchet, of Tulsa, Okla., and will equip a plant at once.

The Iron & Steel Products Company, Tulsa, Okla., has been incorporated with a capital stock of \$100,000 by Max K. Weigel of Tulsa and Fletcher C. Fletcher of Oklahoma City, Okla., to engage in the manufacture and dealing in iron and steel products.

The Hattiesburg Foundry & Machine Works, Hattiesburg, Miss., has been incorporated with a capital stock of \$60,000 by F. A. Maddox, J. S. Love and F. W. Foote.

The city of New Orleans has rescinded a contract recently let and will again receive bids for the equipment for a 4,000,000 gal. filtration plant. It is planned to separate the work into a number of divisions.

The Kenner-New Orleans Interurban Railway, New Orleans, La., has ordered L. C. Weiss, of New Orleans, to prepare plans for a power house and equipment.

The Louisiana State Canneries, New Orleans, La., has been organized with a capital of \$100,000 by P. Seltzer Schneidau, of New Orleans, A. J. Perkins and H. F. Ehrman, of Lake Charles, La., and R. C. Webb, of Rayne, La., and others and will establish large fish canning plants.

Texas

AUSTIN, TEXAS, November 1, 1913.

The past week has seen an awakening of the machinery and tool trade. The good roads movement which is very active is resulting in much road building machinery being purchased. Cooler weather has aided in the renewal of business activity, although the cotton crop has been damaged by the recent frosts which have precluded any possibility of a top crop.

The Scatterbranch Union Gin Company has been organized at Commerce to erect a cotton gin.

Fire damaged the Wesson Iron Foundry Company's plant and equipment at Dallas, Texas, with a loss of about \$6500.

The Standard Tilton Milling Company will erect a six-story reinforced concrete structure at Dallas for its new mill to cost \$200,000. A large amount of new machinery will be installed.

The Marshall Electric Company will install additional machinery in its electric and ice plants at Marshall. Two boilers of 400 hp. and generators are to be installed at the power plant and the capacity of the ice plant increased from 40 to 80 tons.

The Davis & Williams Gin Company, Waxahachie, has been incorporated with a capital stock of \$10,000 to erect a cotton gin.

The City Light and Water Company of Amarillo, which was recently purchased by the Donerty interests of New York, is reconstructing its power plant and will make improvements amounting to over \$100,000.

The Navajo Lumber & Timber Company has bought 630,000,000 ft. of standing timber in the region south of Holbrook, Ariz., from the United States Government. The tract will be opened to development by the Navajo Southern Railroad, which will extend 83 miles south of Holbrook. The new road will also open up rich coal deposits.

The town of Tioga has voted a bond issue of \$12,500 for the construction of a waterworks plant and distributing system.

O. E. Gammil, general manager of the Bryan-College Interurban line, states that arrangements have been completed for the electrification of the road, which runs between Bryan and College Station.

The town of Belton is improving its waterworks plant and extending the distributing system.

An electric light and power plant is to be erected at Santa Rosa, N. M., by J. O. Janes and C. E. McGinnis in connection with the irrigation project of the Santa Rosa Townsite Company, which they have purchased from H. B. Jones of Tacumcari, N. M. An irrigation pumping system is also to be installed.

I. M. Kellogg is promoting the erection of an ice plant and laundry at Chandler, Ariz.

The Northwest Division of the Farmers' Union of Texas, has subscribed stock to erect a large co-operative cotton mill in the Wichita valley section. The union is also planning to build a chain of co-operative cold storage houses.

Construction work has begun on the big irrigation dam of the Arizona Land & Irrigation Company near Prescott, Ariz. The project comprises 10,000 acres of land and considerable pumping machinery will be installed.

The Pacific Coast

PORTLAND, ORE., October 31, 1913.

While the machinery market in general is decidedly quiet, occasional orders of some consequence are being placed. The most important business of the past week was on an attractive list of the Oregon-Washington Railroad & Navigation Company, the greater part of which was taken by the Portland branch of the Eccles & Smith Company. Single tool orders from small shops are coming in fairly well for this time of year, but are hardly as numerous as last month. Notwithstanding the depression in the lumber market, some confidence in the future is shown by the placing of orders for new mills, but the volume is not altogether satisfactory. Local manufacturers of mill and logging equipment are, however, getting some export business. Considerable preliminary figuring is being done on mining and other machinery for Alaska to be delivered in the spring, but it is not expected that the Alaska salmon packers will buy as freely as last year. Efforts are being made toward the installation of equipment to utilize the Alaska salmon waste for oil and fertilizer, but little definite progress has yet been made. While there is considerable railroad construction in progress, not enough new work is coming up to call for much contractors' equipment at present.

The city of Portland is considering the purchase of machinery for a municipal garage.

The Portland Lumber Company is equipping a complete machine shop at one of its camps, to handle all ordinary repair work.

The Willamette Iron & Steel Works recently shipped two logging engines for use in Sumatra and two for use in the Philippines.

J. H. Cogan is installing a planing mill at Cornelius, Ore.

The Burns Flour Milling Company, Burns, Ore., is preparing to install a meat packing plant.

The Sixes Mining Company is putting in a large hydraulic mining outfit and other machinery near Bandon, Ore.

G. L. Rauch has secured a franchise to build a gas plant at Albany, Ore.

Baker City, Ore., will be in the market shortly for a municipal power plant.

C. W. Wakefield and others are preparing to build a shingle mill of about 150,000 daily capacity at Bunker, Wash.

The plant of the Seattle Drydock & Construction Company, Seattle, was recently damaged by fire to the extent of about \$100,000, the planing mill, pattern shed and dry shed being destroyed.

Plans are being drawn for a cannery tender for the Pacific-American Fisheries, Bellingham, Wash., to be equipped with a 100 hp. engine of the Diesel type.

It is reported that the plant of the Griffin Wheel Company, South Tacoma, Wash., will be enlarged shortly.

Bids will be received by the city clerk, Oroville, Wash., until November 10, for a 50 hp. oil and distillate engine.

The Niagara Falls Ladder Company is preparing to build a plant at Hoquiam, Wash.

Eastern Canada

TORONTO, ONT., November 1, 1913.

The Dominion Power & Transmission Company, Hamilton, Ont., has under consideration the construction of a power plant of 2500 hp. capacity at Mohawk Lake with transmission lines to Brantford.

The Richardson Scale Company of Canada, Ltd., Bridgeburgh, Ont., recently incorporated with \$50,000 capital stock, is arranging for the construction of a plant. John A. MacIntosh, F. W. Scott, W. C. LaMarsh and J. A. Gibson are the directors.

Tenders will be received by the chairman of the board of control, Toronto, until November 25, for two 20,000,000 gal. and two 7,500,000 gal. pumps with engine and boiler equipment, coal and ash handling plant for use at the high level pumping station. H. C. Hocken is mayor.

Plans have been completed by Puddy Bros., Toronto, for the erection of an addition to their packing plant, estimated to cost about \$30,000. Considerable new equipment and machinery will be required.

Thomas G. Ellis, A. J. Denomy and others of Windsor, Ont., have incorporated the Parsons Motor Car Company of Canada, Ltd., with \$500,000 capital stock and will establish a plant for the manufacture of motor vehicles.

The Centerfreeze Sanitary Ice Company, Ltd., 601 Merchants Bank Building, Montreal, is contemplating the erection of an artificial ice plant at Westmount.

Metals, Ltd., 30 St. James street, Montreal, contemplates the erection of a factory. Mr. Glass is at the head of the firm.

C. Richardson & Co., St. Marys, Ont., machiner/manufacturer, will erect a four-story addition to their factory.

Delhi, Ont., will install a waterworks system to cost \$32,000. Roger Crysler is clerk.

The Perfection Stove Company's plant at Sarnia, Ont., will be equipped with safety devices and a suction fan system will be installed. The plant will be in full operation by May, 1914.

P. Thornton, president Thornton's, Ltd., Brantford, Ont., has announced that the company would rebuild on a larger scale. Temporary offices have been secured in the Bank of Hamilton Building.

The factory of the London Bed & Mattress Company, London, Ont., was destroyed by fire with a loss of about \$30,000, partly covered by insurance.

The Valleyfield Water Power Company, Ltd., Salaberry de Valleyfield, Que., has been incorporated with a capital stock of \$1,000,000 by N. A. Ostiguy, John Lowe and others.

The Quebec Development Company, Ltd., Montreal, Que., has been incorporated with a capital stock of \$2,500,000 by Arnold Wainwright, Maurice Alexander and others to develop electrical power.

The Atlantic Coast Steamship Company, Ltd., Toronto, Ont., has been incorporated with a capital stock of \$500,000 by R. H. Parmenter, A. J. Thomson and others to engage in shipbuilding.

The Pierson Gas Producer Plant Company, Ltd., Montreal, has been incorporated with a capital stock of \$100,000 by P. V. Rougier, Arthur Decary and others.

The Oxford Worsteds Linens, Ltd., Dorchester, N. B., has been incorporated with a capital stock of \$50,000 by C. S. Hickman, J. F. Teed and others to manufacture worsted and linen goods.

The Seely Mfg. Company, Ltd., Windsor, Ont., has been incorporated with a capital stock of \$100,000 by J. E. Smith, A. C. Leonard and others to manufacture chemicals, drugs, etc.

The Van Buren Excavator Company, Ltd., Toronto, has been incorporated with a capital stock of \$75,000 by W. A. J. Case, H. E. Wallace and others to manufacture iron and woodworking tools and machinery.

The Napoleon Mill, Ltd., Drummondville, Que., has been incorporated with a capital stock of \$75,000 by Napoleon Garceau, Alexandre Mercure and others to manufacture windmills.

Parkers, Ltd., Montreal, has been incorporated with a capital stock of \$50,000 by G. G. Parker, H. C. Parker and others to manufacture shoe findings.

The Michelin Tire Company of Canada, Ltd., Montreal, has been incorporated with a capital stock of \$40,000 by A. E. Woodworth, A. B. Wright and others to manufacture rubber tires.

The Gray Pneumatic System, Ltd., Toronto, has been incorporated with a capital stock of \$500,000 by J. M. Duff, Frank Regan and others to manufacture accessories for motor cars.

The Rideau Shoe Company, Ltd., Montreal, has been incorporated with a capital stock of \$1000 by G. V. Cousins, A. H. Elder and others to manufacture shoes.

The W. W. Butler Company, Ltd., Montreal, has been incorporated with a capital stock of \$100,000 by H. R. Mulvena, T. J. Coonan and others to manufacture railroad, marine and foundry supplies.

Western Canada

The Consolidated Asphalt Corporation of Canada, Ltd., Winnipeg, Man., has been incorporated with a capital stock of \$1,500,000 by Dr. R. M. Simpson, of Winnipeg, Dr. Clarence W. Field and others.

The Crystal Ice Company, Calgary, Alberta, will erect a large ice plant at the corner of Eleventh avenue and Fourteenth street west.

The Watkins Medical Company, Wyoming, Minn., will erect a large factory and warehouse at Winnipeg, Man.

The Orpen Conduit Company, 165 King street west, Toronto, plans to erect a plant at Fort William, Ont.

Fire seriously damaged the plant of the Canada Malting Company, Winnipeg, Man. The loss, covered by insurance, amounted to about \$30,000.

The P. H. Rice Malting Company, of Winnipeg, Man., will locate a malting plant and elevator at Lethbridge, Alberta. The plant is to cost \$200,000.

Several carloads of steel have been received for the building of the Saskatchewan Bridge & Iron Company, Ltd., Medicine Hat, Alberta. The grading of the railroad spur to the site has been completed. The new gas well is ready for use and the company expects to build about 40 houses for the employees.

Government Purchases

WASHINGTON, D. C., October 30, 1913.

Bids will be received by the Bureau of Supplies and Accounts, Washington, until November 25, under schedule 5984, for a grinding machine for Newport; under schedule 5985 for ventilating fans and spare parts for Boston and ventilating fans with motors for Philadelphia; under schedule 5988, for hydraulic lifting jib cranes for Norfolk; under schedule 5989 for air compressors, f.o.b. works; under schedule 5990 for a direct-current exciter unit for Annapolis.

Bids will be received by the Engineer Depot, United States Army, Washington Barracks, D. C., until November 14 for sixteen motor-driven exhaust fans. Address Joseph E. Kuhn, lieutenant colonel, corps of engineers, United States Army.

Bids will be received at the office of the District of Columbia, Washington, until November 12, for furnishing and delivering one 42-in. vertical boring and turning mill for use in the District of Columbia Water Department. Address the dispersing officer, room 320, District Building, Washington.

Bids will be received by the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until November 22 for motor-generator sets, transformers and other electrical apparatus.

Bids were received by the general purchasing officer of the Isthmian Canal Commission, Washington, D. C., October 23, for furnishing the following supplies:

Class 5. One double winch engine—American Engineering Company, \$450. 45 days; Lidgerwood Mfg. Company, \$384, no time.

Class 6. One pneumatic riveter—Chester B. Albree Iron Works Company, \$2600, 90 days; Bethlehem Steel Company, \$3300; 156 days; Vulcan Engineering Sales Company, \$5350, 100 days.

Class 7. One oxy-acetylene apparatus—Oxy-acetylene Appliance Company, \$343, 30 days.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, October 28 for furnishing supplies for the navy yards as follows:

Schedule 5869—Construction and Repair.

Class 1. Puget Sound—One combination planer, matcher, and timber dresser—Bid 14, \$3313.55 and \$3376.91; 70, \$3601.84; 102, \$2750; 176, \$2798.90 and \$3046.

Class 1. Alternate—F.o.b. works—Bid 3, \$3695.60 and \$3637.10; 14, \$2980.80 and \$3044.16; 16, \$2564; 70, \$3265.18; 102, \$2325.

Class 2. Puget Sound—One 60-in., 3-drum sander—Bid 14, \$2081.46 and \$2110.26; 70, \$2248.79.

Class 2. Alternate—F.o.b. works—Bid 3, \$2160 and \$2270; 14, \$1880.28 and \$1909.08; 70, \$2052.17.

Class 3. Puget Sound—One 8 x 30-in. surfer—Bid 14, \$2279.20 and \$2332; 70, \$2223.63.

Class 3. Alternate—F.o.b. works—Bid 3, \$2900, \$2900, \$1900 and \$2000; 14, \$2051 and \$2103.80; 70, \$2034.22.

Class 4. Puget Sound—One self-feed circular ripsaw—Bid 14, \$571.95 and \$644.95; 70, \$597.57; 78, \$606.18; 102, \$616.50; 121, \$546.

Class 4. Alternate—F.o.b. works—Bid 3, \$640 and \$695; 14, \$516.92 and \$589.92; 16, \$648 and \$628; 70, \$536.77; 78, \$544.58; 102, \$530; 121, \$480.

Class 5. Puget Sound—Buzz planer and jointer—Bid 3, \$420 and \$485; 14, \$359.57 and \$437.37; 76, \$423.23; 76, \$495; 78, \$411.41; 102, \$383.45; 121, \$451; 140, \$490, \$455 and \$400.

Class 5. Alternate—F.o.b. works—Bid 14, \$311 and \$388.80; 16, \$516 and \$500; 70, \$380.91; 76, \$380; 78, \$372.43; 102, \$338.40; 121, \$385; 140, \$409, \$386, and \$331.

Schedule 5879—Construction and Repair.

Class 6. Mare Island—One oxygen-hydrogen generating plant—Item 1—Bid 22, \$10,765; 58, \$10,600; 97, \$10,000.

Item 1A—Bid 97, \$10,000.

Item 1B—No bids.

Item 1C—No bids.

Item 2A—Bid 97, \$1093.

Item 2B—Bid 22, \$1088; 97, \$1811.

Item 2C—No bids.

Item 3—Bid 58, \$1919, \$1607, and \$1801; 97, \$1135 and \$1088.

Item 3, Alternate—Bid 22, \$1595.

Item 4—Bid 22, \$135; 97, \$75.

Item 5—Bid 58, \$1251.

Schedule 2882—Construction and Repair.

Class 9. Puget Sound—One 10-ft. power squaring shears, delivered f.o.b. wharf—Bid 36, \$1660; 121, \$1585, \$1607, and \$1678; 142, \$1657; 167, \$2310.

Class 9. Alternate A—Inspected at point of delivery only—Bid 36, \$1660; 66, \$1885.

Class 9. Alternate B—Delivered f.o.b. works, bidder's time—Bid 36, \$1300; 93, \$2457; 107, \$1296.50; 121, \$1318, \$1340, and \$1366; 137, \$1290.

Schedule 5893—Steam Engineering.

Class 11. Puget Sound—One turbo-generating set—Bid 81, \$1761.05; 191, \$1111.

Class 11. Alternate—F.o.b. works—Bid 83, \$1686.05; 191, \$1076.

Class 82. Boston—One electric heated oil tempering bath—Bid 83, \$566; 186, \$300.

Class 83. Boston—One single-frame, self-contained tool-dressing hammer—Bid 26, \$475; 72, \$396; 121, \$385; 221, \$506.

Class 84. Boston—One universal grinding machine, belt driven—Bid 18, \$707.80; 73, \$680; 91, \$950; 118, \$650; 121, \$815 and \$835; 137, \$637.

Class 85. Boston—One cutter and tool grinder—Bid 18, \$505.30; 72, \$398.80; 91, \$515; 121, \$520, \$602, and \$677; 135, \$415; 221, \$350 and \$343.

Schedule 5937—Construction and Repair.

Class 146. Norfolk—Three chain worm-gearred blocks—Bid 30, \$29.47; 82, \$29.84; 123, \$21; 193, informal; 212, \$34.09.

Class 147. Brooklyn—17 blocks, double-composition swivel hook—Bid 23, \$126.65; 30, \$126.48; 82, \$126.48; 144, \$132.32; 193, informal.

The names of bidders and the numbers under which they are designated in the above list are as follows:

3. American Woodworking Machinery Company.

14. Berlin Machine Works.

16. Bentel & Margedant Company.

18. Brown & Sharpe Mfg. Company.

22. Berdett Mfg. Company.

23. Boston & Lockport Brick Company.

26. Buffalo Foundry & Machine Company.

30. F. S. Banks & Co.

36. Bertsch & Co.

58. Davis-Bournonville Company.

66. Excelsior Tool and Machine Company.

70. J. A. Fay & Egan Company.

72. Fairbanks Company.

73. Walter H. Foster Company.

76. Frevert Machinery Company.

78. Greenlee Bros. & Co.

82. R. W. Geldart.

83. General Electric Company.

91. Hill, Clark & Co.

93. Hilles & Jones Company.

97. International Oxygen Company.

102. Kemp Machinery Company.

107. Loy & Nawrath Company.

118. Modern Tool Company.

121. Manning, Maxwell & Moore.

123. George W. Millar & Co.

135. Niles-Bement-Pond Company.

137. De Nast Machinery Company.

140. Oliver Machinery Company.

142. George A. Ohl & Co.

144. J. E. Ogden Company.

167. D. H. Stoll Company.

176. Stelson-Ross Machine Works.

186. Tate, Jones & Co.

191. Terry Steam Turbine Company.

193. Universal Trading Company.

212. William E. Williams.

221. Prentiss Tool & Supply Company.

